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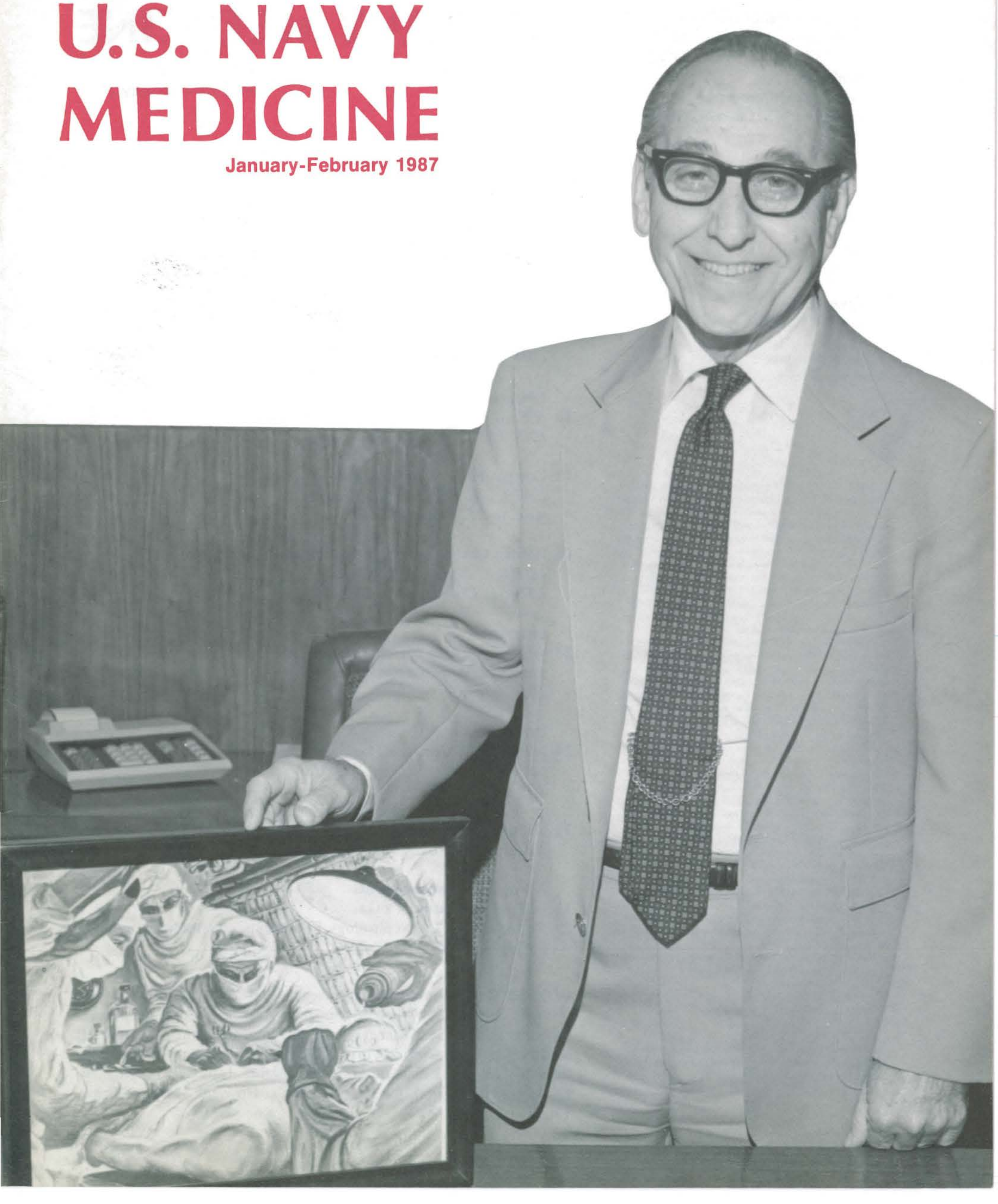
U.S. NAVY MEDICINE

January-February 1987



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COVER: On 11 Sept 1942 Pharmacist's Mate Wheeler B. Lipes performed a surgical first when he removed a shipmate's appendix aboard the submarine USS *Seadragon*. Lipes, now president of Memorial Medical Center in Corpus Christi, TX, poses with a copy of a painting from the July 1943 issue of *Esquire* magazine. Interview on page 20. Photo by HM1 Frank Passalacqua, Naval Hospital, Corpus Christi, TX.

Graduate Medical Education

Few factors will so decisively influence the future of the Navy Medical Department as our ability to successfully ensure the quality and viability of Graduate Medical Education (GME) programs. We must continue to grow from within our own ranks a large percentage of those specialists needed to meet the current and projected operational and readiness medical requirements.

GME is facing serious challenges as we enter 1987. Solutions will require efforts across the board within Navy medicine. Starting at the top with forceful leadership and extending to each practitioner and program director, creative and innovative steps must be taken so as to take advantage of every opportunity to make these programs successful.

It is clear that our readiness requirements for the future cannot be met entirely by in-service programs. Therefore, full-time out-service positions will be made available in anesthesiology, orthopedics, and general surgery for academic year 1988.

A realignment of faculty billets in our teaching hospitals is ongoing, utilizing the recently completed faculty staffing requirements for GME professors. But faculty billets, while important, aren't the major need. Support personnel of all sorts are necessary to make our providers more efficient and to utilize our facilities to the maximum extent possible. Fully operational facilities are, at bottom, the major requirement for a healthy GME program. While our ultimate growth will be limited, I will continue to give this top priority attention.

It is clear to all of us that Graduate Medical Education programs provide us with the "seed corn" of the Navy Medical Department of the future. We must continue to use every means and make every sacrifice to ensure the future viability of our medical professional base. It will depend upon persistence, innovation and vision, and a great deal of concentrated effort on the part of all of us involved with the process. I want to assure you of the extremely high priority which I put on these initiatives and will continue to devote vigorous efforts to see that there are improvements in 1987 and beyond.

Although the current Washington climate is one of austere budgets, I shall continue to make every effort to correct identified deficiencies in material and support personnel.

In order to do this successfully, I depend on you for your help and support. You can count on mine.

RADM Joseph S. Cassells, MC

Too Cold for Comfort

NMRI Scientists Study Human Adaptability

The shivering is easier to detect first on the EKG machine, where it shows up in the form of quick, jagged spikes between heartbeats. Minutes later, the naked eye can see the skimpily clothed man start to shiver unmistakably and uncontrollably as his nose turns red and goose bumps appear all over his body. These reactions come as no surprise to the viewer, as the subject is sitting in socks, shorts, and t-shirt in a kind of brightly lit meat locker for humans. The temperature is about 38° F.

HM2 Michael Schmeister, 27, is wired from head to foot so scientists can observe his physiological responses to the cold. One wire is a rectal probe hooked to a monitor. Another is a catheter device with a shut-off valve in his left arm, from which seemingly huge quantities of blood are drawn for extensive analysis; his heart is monitored on an EKG machine in the next room. Sensitive metal tabs send messages from his index fingers and the back of his neck to devices which read their temperatures. Scientists watch him either inside the refrigerator or outside through a small window.

Schmeister is a member of a control group in a series of experiments at the Naval Medical Research Institute (NMRI), Bethesda, MD, designed to reproduce the antarctic cold environment and study its effects on humans.

Assignment in Antarctica

LCDR H. Lester Reed is the man responsible for NMRI's current set of cold temperature stress experiments. He became interested in the subject when he was sent in 1980 as a physician and member of a 70-person Naval Support Force Antarctica detachment, which bolsters the work of the National Science Foundation. Reed thought it would be interesting to draw blood samples before, during, and after the antarctic experience and analyze the blood for significant changes. "If cold adaptation occurs, it should occur in those who have been there a year," Reed stated. He drew his own blood and blood from 17 comrades before they went, 6 months later, and after a year of exposure to the cold.

Aside from research, Reed said the cold study also provided "goal-oriented behavior" for the people who were going to the isolation of Antarctica. Goal-oriented behavior is known to be helpful in relieving the stress of isolation.

Reed is an endocrinologist who has studied medicine at the University of Kentucky and was an Endocrine Fellow at the Naval Hospital Bethesda, under Dr. Jack O'Brian. His main focus in these experiments is the response of thyroid hormones to cold stress. Thyroid hormones, Reed explains, "are ubiquitous throughout the body." They regulate the metabolic rate, the kidney function, water balance, red blood cell synthesis, and calcium production. "We know its absence causes people to become ill," Reed said. Too much makes you hot; too little makes you cold. Too much can lead to bizarre thoughts; too little makes a person sluggish and lethargic.

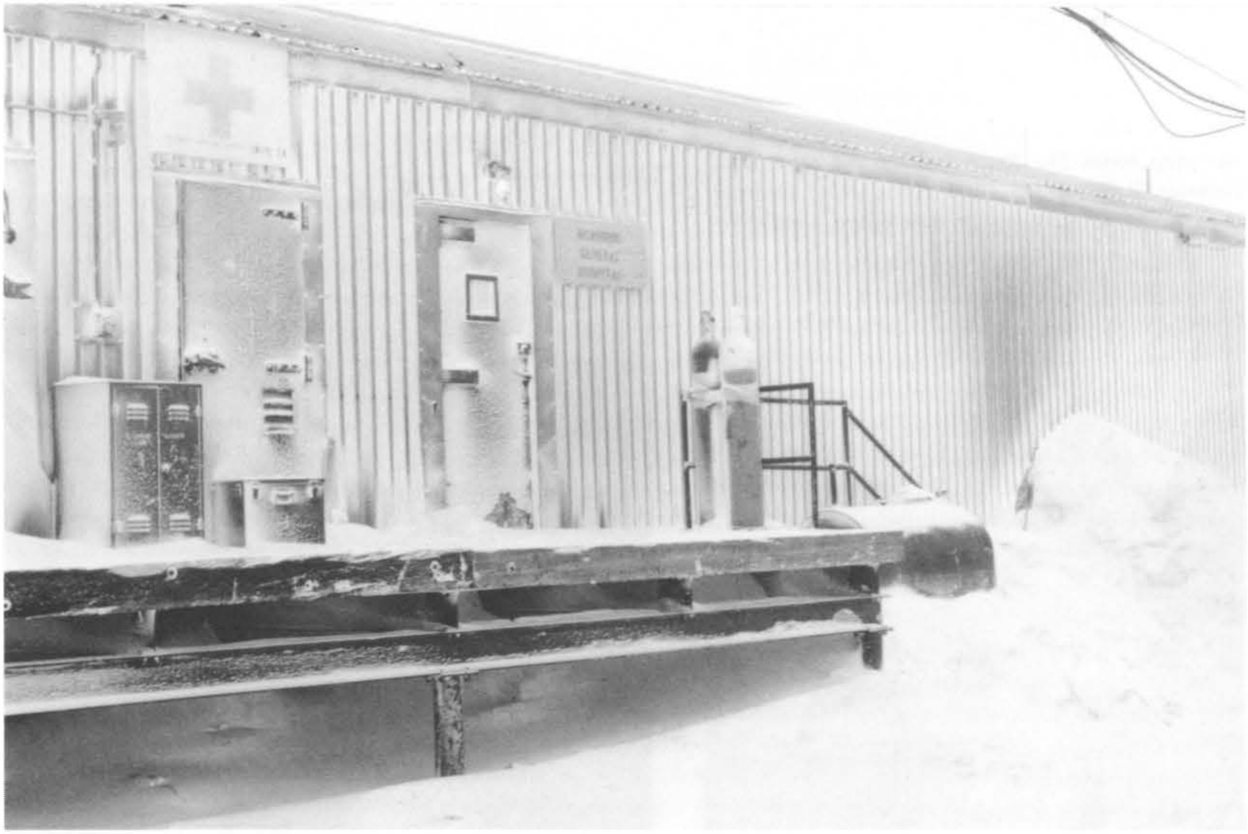
"One would think, "Dr. Reed said, "if you go to a cold place, you ought to have more of these hormones around," since the nature of the hormone is to raise one's body temperature. But that turned out not to be the case. "Instead of finding too much of these hormones, we found lower levels." Reed and his colleagues thought the results were incorrect and sent the blood to another laboratory for analysis. That analysis supported the original results from the blood samples drawn. Four later tests confirmed those results, Reed said.

Whether the decreased level of hormones is good or bad for the body in question is hard to say. "It's likely it's beneficial," Reed said, "but there's really no way to know from the data we have collected up to now. The bottom line is, how the sailors do in response to the cold."

After exposure, "they do marvelously," Reed said. "They get less frostbite, they're more comfortable with less clothing, they're more functional. They play football outside with shorts on," he continued, "in temperatures around 30° F." Hormonally, they are very different from when they arrived, although different in a way that Reed had not originally anticipated.

Protecting Our Northern Flank

Why is the Navy interested in studying how cold affects people? One reason is to predict who will do well in a cold environment and who will not. "It's useful in thinking about where we're going to deploy people," said CAPT Stephen Lewis, the senior officer involved in the research project and deputy director of the environmental stress department. If someone who is short and stubby, comes from a



The antarctic Navy medical facility where Dr. Reed conducted blood studies in 1980 and 1981.

northern climate, and has never had frostbite and will do better in the cold, why not send him instead of someone who will suffer and be unable to function?" asked Dr. Reed.

The idea also is to determine whether a series of short exposures to moderately cold temperatures can actually adapt people ahead of time, so that if they must go to a cold environment, they can be prepared before leaving the United States. Reed said the scientific literature does not commonly hold that cold adaptation prepares people for the cold the way heat exposure prepares them for heat. But he believes people do have an adaptive mechanism to cold and that eventually we may be able to adapt a human in a single day.

"We can figure out how humans are changing," Reed said. If the human body actually does change from cold exposure, it is possible it may change in a way that can be hurried along with various medicines, or hurried along and changed more quickly with body sizes or various exercises, or that certain diets can be changed to help people adapt more quickly.

Dr. Sharree Pepper, a physiologist who works closely with Dr. Reed, said the experiments may help the troops protecting our northern flank—those involved in NATO exercises—and also help the "everyday person" perform better in the cold.

"If we could find out what it is that makes someone function better in the cold, then maybe we can help develop it more rapidly," Pepper said. She is interested in the reaction of stress hormones to cold, to heat, and to the injection of a substance that stimulates hormone production. She is studying hormone levels to see if people who respond to stress with higher hormone levels do better than others.

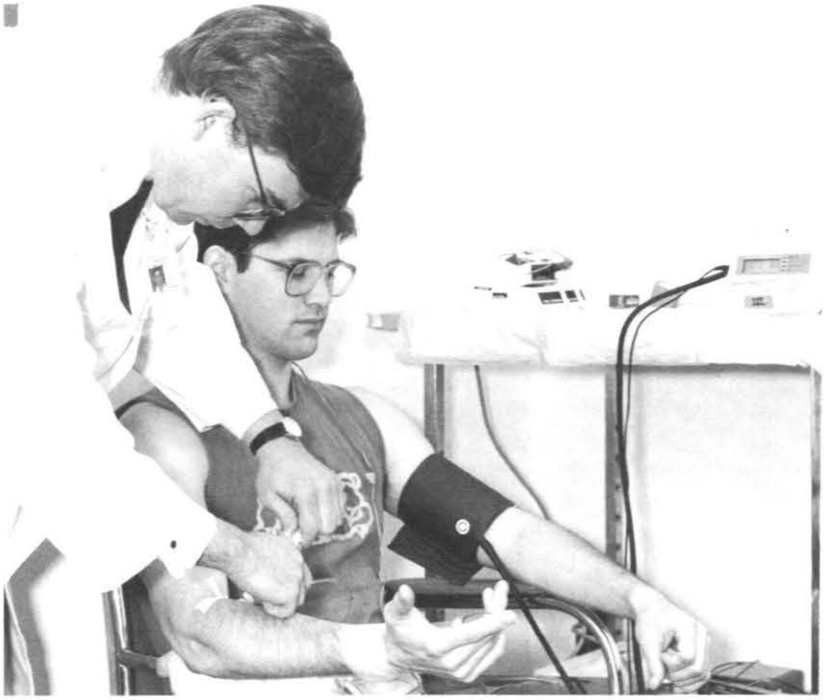
CAPT Lewis is interested in the body's endocrinologic and metabolic adaptation to acute hot and cold stress and the role that conditioning may have in this adaptation. He is trying to generalize from this experiment and apply his findings to normal man. One area of particular interest to him is the reaction to stress of hypertensive individuals, since about 5 percent of service members have hypertension. Lewis noted that heart attack is virtually unknown in the hot Middle East but is common in cold Scandinavian countries.

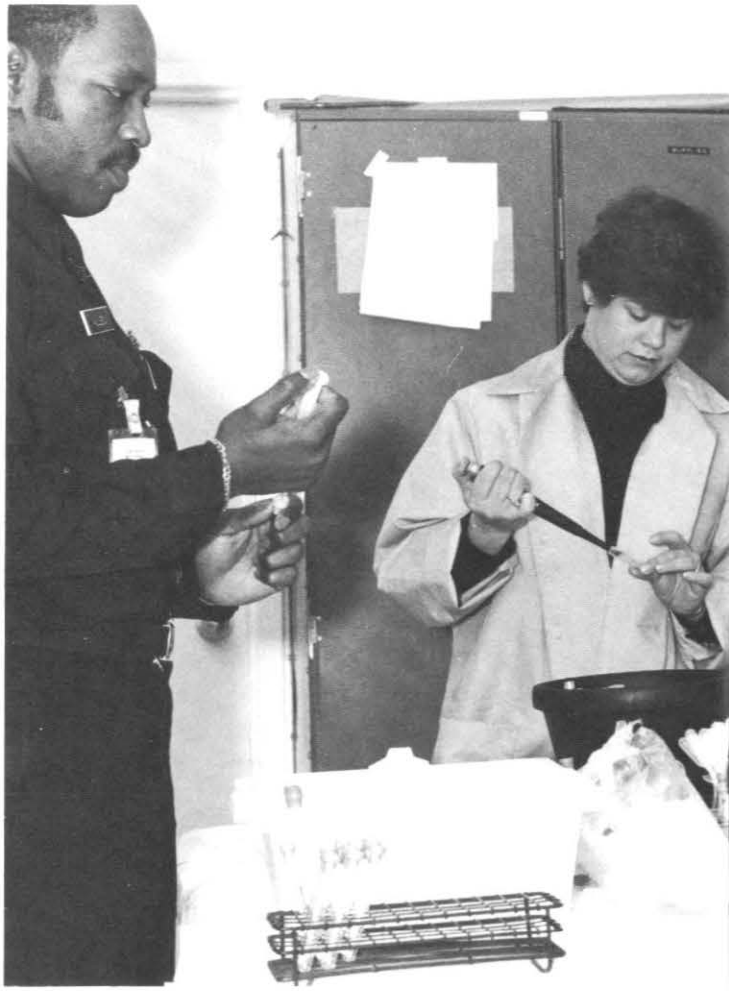
Dr. Lewis is also examining cholesterol and lipid levels to see if they are favorably or adversely affected by exposure to the cold. He is looking at pancreatic insulin production to find out what kind of energy source might be most useful for people in cold environments. If insulin in the blood stream goes way down in response to the cold, "we would encourage a high-fat diet rather than a high-carbohydrate diet," Lewis said.

People who are not acclimated to the cold can experience some major problems in a cold climate. The worst case is such a serious decline in the body's core temperature that death results. But long before that happens, other debilitating situations appear. One is the body's extreme urgency to urinate in the cold.

"This is an operational nightmare," Reed said. What happens is that in the cold the troops make more urine; they get thirsty, and stop to eat snow to alleviate their thirst. Eating the snow makes them colder; they make more

Below: *In the prep room Dr. Reed draws a subject's blood through a catheter.* Right: *HM2 Larry Allen, HM3 Deborah Russell, and Dr. Reed separate and prepare blood samples for analysis.*





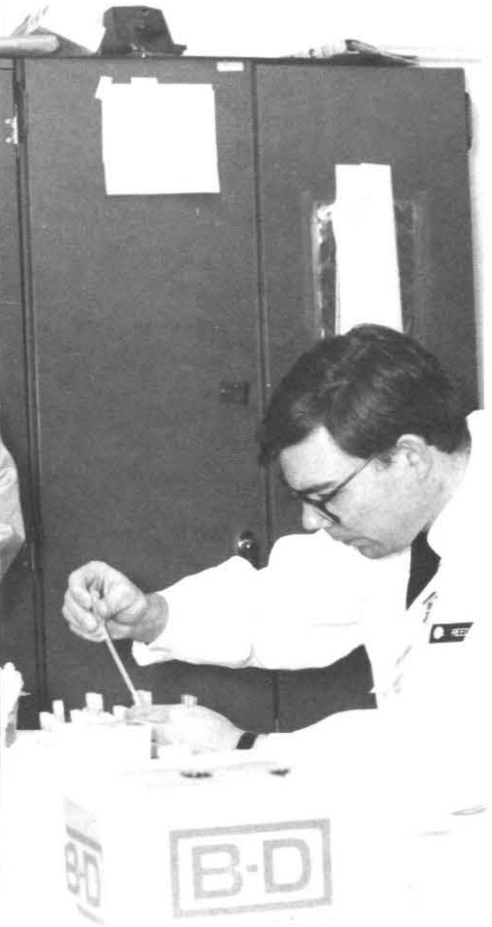
urine, and they get extremely dehydrated. Then the commanding officer has to stop the troops, build a fire, heat water (snow) for tea, and have the troops drink the tea. Obviously this wastes a lot of time. Meanwhile, when the body makes urine, blood leaves the fingers and toes and people begin to get what are called nonfreezing cold injuries. The fingers begin to swell and can become infected.

Other major adverse effects of nonadaptation to cold are the inability to work because the hands and feet are too cold, and the inability to think properly. The latter condition is one variable among many being examined in the NMRI experiment.

NMRI's Experiment

Here's how the experiment works. Baseline studies are done on the subjects "to find out what the individual's physical and chemical parameters are before we do anything," said Kathleen Kowalski, the exercise physiologist in charge of this aspect of the experiment. The baseline studies include skinfold measurements, basal metabolic rate (how much oxygen a person consumes at complete rest), blood pressure measurement to measure the functioning of the orthostatic nervous system (while the subject stands bolt upright, strapped to a board), and peak oxygen consumption, measured while the subject runs on a treadmill. The subjects also are seated in what looks like a large dentist's chair. One hand is immersed in water at about 45° F for 2 minutes in a square metal box. Kowalski then measures the skin temperature of the hand and the opposite foot and measures the amount of oxygen the subjects are consuming by having them blow through a tube, as they would in the hospital's pulmonary clinic. Blood is also tested for thyroid, pituitary, and catecholamines, the "fight or flight" hormones (norepinephrine and epinephrine). Other tests measure the hormonal group which regulates urine flow (renin, aldosterone, angiotensin, antidiuretic hormone or ADH, and atrial natriuretic factor or ANF); insulin; glucagon; growth hormone; and prolactin. Blood is also measured for circulating metabolites (lactic acid, glycerol, acetoacetate, and beta hydroxybutrate), free fatty acids, lipids, and electrolytes.

These baseline measurements were done on 16 subjects (all males, between 24 and 33 years of age), over about a month's time. There were four or five sessions per person which were repeated after 20 cold air exposures. Then, because it has been suggested that the ability to endure heat indicates a better ability to tolerate cold, the subjects went through two heat exposures of



120° F and 40 percent relative humidity for 30 minutes at a time, one at the beginning and the other at the end of the experiment. Kowalski, Reed, and Lewis took turns measuring their blood pressure, pulse, weight loss, and rectal and skin temperatures. They also administered a computerized thought test, which measures short-term memory and quickness in interpreting a pattern. The scientists took blood samples before, during, and after the heat exposure.

The experimenters handled cold exposures in much the same way, actually using the same chamber, but now with the temperature at about 38° F. The 20 cold exposures were also for 30 minutes at a time. "We don't make them *very* cold," Dr. Reed said. "Not cold enough to lower their body temperature. We believe it requires a very mild exposure to hands or face, repeated several times, over time (in this case over a 5-week period), for a person to become adapted."

So far there are no conclusive results, but Reed said preliminary findings show the circulating level of the thyroid hormone is lower in a person exposed to cold over time. This means either the production of the hormone is lower or the degradation is higher. More norepinephrine—which increases the degradation of thyroid—is produced.

According to Dr. Reed, it looks as though the system regulated by norepinephrine and epinephrine becomes more sensitive and that the body uses more oxygen after the 20 exposures to cold.

He and his colleagues published two abstracts in December 1986. One correlated how people did in cold and heat and predicted how they would do by giving them the cold hand test in advance. The other abstract discussed the stress of cold exposure measured by the oxygen saturation of hemoglobin, which is an indicator of the tissue's response to a particular skin temperature. Reed said more conclusions from the cold stress experiments should be available by the time he returns from his next trip to Antarctica. □

—Diane LaMacchia, Public Affairs Office, Naval Medical Command, Washington, DC 20372-5120. Photos by HM3 Michael Spencer.

Inside the cold chamber Dr. Lewis reads a subject's vital signs as Ms. Kowalski records physiological data.

Subject takes a thought test at the computer terminal as Dr. Lewis and Dr. Reed look on.

Screening for Colorectal Cancer

LCDR Michael M. Van Ness, MC, USN   CDR Sarkis J. Chobanian, MC, USNR

Colorectal cancer is a major health problem in the United States. In 1985, 138,000 new cases were diagnosed with only half detected at a curable stage.(*1*) Colorectal cancer is the second most common cause of cancer-related deaths in both men and women. At the present time, attention is focused on secondary prevention with early detection and surgical cure. Accordingly, the American Cancer Society recommendations for screening of asymptomatic persons with only age-related risk for colorectal cancer(*2*) include an annual digital examination of the rectum beginning at age 40, annual fecal occult blood testing (FOBT) beginning at age 50, and rigid proctosigmoidoscopy at age 50 and 51 and every 3–5 years thereafter. Although results of screening efforts suggest a benefit based on early stage diagnosis of disease localized to colon and rectum,(*3–8*) other authors are more skeptical(*9–11*) and are testing the sensitivity, specificity, and cost effectiveness of this approach. Review of the development of the different components of the American Cancer Society's recommendations will reinforce the need for continued efforts and improved means to meet this challenging clinical problem.

The first report of the use of rigid proctosigmoidoscopy for screening asymptomatic patients for colorectal cancer was made by Hertz(*3*) in 1960. In a retrospective analysis, he found rigid proctosigmoidoscopy was the primary factor in diagnosis of 76.5 percent of 58 cases of colorectal cancer in 16,126 asymptomatic persons screened in the years 1946 to 1954. Because the overall 5-year survival rate was 88 percent, he recommended inclusion of rigid proctosigmoidoscopy in any cancer detection program. Dales(*6*) demonstrated survival benefit in a prospective controlled study screening asymptomatic persons in a multiphasic preventive medicine program. He also concludes that routine proctosigmoidoscopy is of benefit in asymptomatic persons.

Despite these findings, the American Cancer Society believes more is required than routine rigid proctosigmoidoscopy. Rigid proctosigmoidoscopy is not an ideal screening procedure. It is not popular among either patients or physicians—a fact which limits significantly the compliance among asymptomatic patients. Winawer(*12*) believes that with this technique, careful and consistent examinations are possible only in the distal 16 cm of the colon. This limitation assumes more importance in light of the finding of Snyder(*13*) who demonstrated a proximal shift of colorectal carcinoma in a study of 40,771 cases of colorectal carcinoma recorded in the Connecticut Tumor Registry from 1940 to 1973 with not only an increasing proportion of colorectal carcinoma in the ascending colon, but also a consistent overall increase in the incidence of colorectal carcinoma, especially among people over 65 years old.

Other studies have confirmed the limitations of rigid proctosigmoidoscopy. Kurnick(*4*) discovered 16 asymptomatic colorectal cancers in 5,595 persons enrolled in a community hospital cancer detection program. Of the 16 cancers, only eight (50 percent) were detected by rigid proctosigmoidoscopy with the other half being detected by FOBT. Nostraut(*11*) recently suggested that rigid proctosigmoidoscopy should be abandoned for screening purposes for lack of sensitivity in detection of colonic carcinomas. The results of a study by Tedesco(*14*) further emphasizes this point. In a prospective colonoscopic study of 642 consecutive patients, only 28 percent of colorectal cancers present were within reach of the rigid proctosigmoidoscope.

Rigid proctosigmoidoscopy fails in another way as a screening tool for colorectal cancer, as it is not sensitive in the detection of colonic adenomatous polyps. Any program designed to decrease the number of deaths from colorectal cancer should have sufficient sensitivity to detect these potentially precancerous lesions.(*15*)

Dr. Van Ness is on the staff of the Department of Gastroenterology, Naval Hospital, Bethesda, MD 20814. Dr. Chobanian is assistant head of the department.

Adenomatous polyps are common findings in the older age groups. In an autopsy study, Rickert(*16*) found 243 adenomatous polyps in 518 autopsy specimens, two thirds in the cecum, ascending colon, and transverse colon. Although less than 5 percent of adenomatous polyps will develop into carcinoma, detection and removal of these lesions is required to interrupt the adenoma-carcinoma sequence. Tedesco(*14*) demonstrated that rigid proctosigmoidoscopy is capable of detecting only 5 percent of the colorectal adenomas present at colonoscopy. Rigid proctosigmoidoscopy is an inadequate screening method for detection of potentially precancerous adenomatous polyps.

Flexible fiberoptic proctosigmoidoscopy is a superior method for colorectal cancer and polyp surveillance. Introduced into clinical practice by Overholt,(*17*) these instruments have evolved to the point where examination of the entire rectum and sigmoid colon is feasible, easily taught to primary care physicians,(*18*) and comfortable for the patient. More experienced operators can examine the descending colon routinely as well. According to the work of Tedesco(*14*) and Snyder,(*13*) one would expect these more complete examinations to detect up to 66 percent of asymptomatic colorectal cancers and polyps despite the more proximal distribution of these lesions.

Routine examinations require a minimal preparation, take from 5 to 12 minutes, can be learned by primary care physicians, and cost from $100 to $250. Given these factors, when available, fiberoptic proctosigmoidoscopy is the preferred method of screening for colorectal carcinoma, not rigid proctosigmoidoscopy.

FOBT is recommended by the American Cancer Society to complement the rigid proctosigmoidoscopic examination in detection of more proximal carcinomas and adenomas. Although FOBT was introduced into clinical practice in the 1950's, the original benzidine and Hematest methods lacked specificity and were abandoned because of unacceptably high false-negative(*19*) and false-positive(*20,21*) rates. In 1967 FOBT employing guaiac-impregnated paper (Hemoccult) was initiated.(*22*) The guaiac reaction depends on the oxidation of a phenolic compound, alpha guaiaconic acid, to a blue-colored, highly-conjugated guinone. The peroxidase-like activity of hemoglobin facilitates the oxidation of the guaiac reagent by hydrogen peroxide present in the developer solution. Peroxidase-like activity is present in animal hemoglobin and many fresh fruits and vegetables.

Intestinal hemoglobin-degradation products like porphyrins lack peroxidase activity and are not detected with the guaiac method. The lower limit for detection of blood by tests currently commercially available (Hemoccult II) is 2 g of hemoglobin per 100 g of stool. In the initial clinical trials of FOBT in asymptomatic persons, Greegor(*22*) found seven colorectal cancers among 2,000 patients screened. Winchester,(*23*) Miller,(*5*) and Kurnick(*4*) all report detection rates of from 0.10 percent to 0.16 percent of screened asymptomatic persons.

This disappointingly low detection rate has led to attempts to increase the sensitivity of FOBT for colorectal neoplasia. Using ^{51}Cr-labeled red blood cells, Herzog(*24*) and Macrae(*25*) showed that a series of FOBT's are required to detect the low levels of intermittent bleeding associated with both benign and malignant colonic neoplasms. Macrae(*25*) found that rehydration of slides overcame the loss of sensitivity associated with time delayed between sampling and slide development—the so-called storage delay. Among 46 patients known to have colonic carcinoma, he found that rehydration decreased the false-negative rate from 31 percent for non-rehydrated slides to 9 percent for rehydrated slides. Other authors have demonstrated similar results.(*26,27*) A series of guaiac cards (two per day for 3 days) and rehydration is currently recommended.

Rehydration requires dietary modifications to minimize false-positive reactions. Greegor(*22*) recommends a high-fiber, low red-meat diet. On a similar regimen, Macrae(*28*) found only 5 of 314 (1.6 percent) specimens from normal volunteers falsely positive. Other dietary modifications suggested to minimize false-positive reactions include avoidance of certain fresh vegetables (tomatoes, radishes, broccoli) and fruits (cherries, citrus). Not only should these be avoided during the 3-day testing period, but also in the 2–3 days prior to initiation of FOBT.(*2*) These measures will minimize the rate of false-positive tests and will help control the costs of any screening program.

Certain drugs can also alter the sensitivity and specificity of FOBT. False-positive tests can result from supplemental iron ingestion, a reaction Lifton(*29*) reported with nonhydrated slides in more than 50 percent of healthy normal volunteers on a meat-restricted diet taking 300 mg of either ferrous sulfate or ferrous gluconate three times per day. Grossman(*30*) showed that gastric irritants like salicylates may induce gastrointestinal blood loss and give false-positive test results. Most practitioners now follow the manufacturer's recommendation to abstain from ingestion of alcohol, indomethacin, phenylbutazone, corticosteroids, and reserpine during FOBT. Although it has been stated that guaifenesin can cause a false-positive guaiac reaction,(*31*) the bulk of the evidence does not support this claim. Ogburn and Craner(*32*) and Brown(*33*) showed no false-positive reactions in two controlled trials involving a total of 33 normal volunteers ingesting glycerol guaicolate in doses ranging from 5 ml every 4 hours to 30 ml every 6 hours.

Only one agent has been demonstrated to cause false-negative FOBT. Jaffe(*34*) studied the effect of vitamin C in a patient with hyperviscosity syndrome and Waldenstrom's macroglobulinemia. During periods of vitamin C ingestion (500 mg P.O., o.i.d.), stool hemoccult tests were uniformly negative. Positive tests were present consistently when no vitamin C was given. Roentgenographic studies of the bowel were negative. In vivo testing showed inhibition of the FOBT by vitamin C at a concentration of 15.4 mg per deciliter of stool. Therefore, to avoid false-negative FOBT, we recommend that vitamin C be avoided during periods of fecal occult blood testing.

Efforts to surmount the difficulties of FOBT with the guaiac method (i.e., lack of sensitivity and specificity, storage delay, dietary restrictions, drug interferences, rehydration) have resulted in the development of Hemoquant, a new assay for fecal hemoglobin and hemoglobin derivatives, based on the chemical conversion of nonfluorescing heme to intensely fluorescent porphyrins.(*27*) It is quantitative, not qualitative like Hemoccult. It is unaffected by stool liquidity, storage delay, or intestinal degradation of hemoglobin. It is specific for human hemoglobin. Although the predictive value of the Hemoquant assay for colorectal adenomas and carcinomas remains to be determined by controlled clinical trials, preliminary evidence suggests a high degree of discrimination between healthy patients and patients with colorectal carcinoma. This promising technique is suitable for automation and may be applied appropriately to mass screening programs.

Although FOBT has been shown to detect colorectal cancer in asymptomatic persons, the true benefit and full impact of a program like the American Cancer Society recommendations has not been determined in a controlled trial. In particular, although detection of earlier stage lesions is to be expected by FOBT, survival benefit for study populations has not been proven. Two controlled trials now in progress by Winawer(*10*) and Gilbertsen(*9*) should provide cost and survival benefit information. Winawer enrolled 22,000 patients from 1975 until 1979 in a long-term study comparing: (1) annual FOBT and rigid proctosigmoidoscopy (the study group) with (2) annual FOBT alone (the control group). Patients were asymptomatic at the time of enrollment and consumed a meat-free, high-bulk diet for 4 days before collection of six Hemoccult II slides. The storage delay was 4 days, and slides were hydrated only during a selected period. For the remainder of the time, slides were not rehydrated. All patients with a positive slide were evaluated with air-contrast barium enema and colonoscopy. In the first report of findings from this study, a total of 71 colon cancers were detected, 12 in the control group and 59 in the study group. Within the study group, 36 (61 percent) of the colorectal cancers were detected by FOBT alone, 7 (12 percent) by FOBT and proctoscopy, and 16 (25 percent) by proctoscopy or by symptoms leading to further evaluation. Colon cancers detected in the study group had a more favorable Dukes' classification compared to the control group. In the study group, 66 percent of the colorectal cancers were carcinoma-in-site, Dukes' A, or Dukes' B compared to only 33 percent of the 12 colorectal cancers found in the control group.

Winawer's analysis has yielded useful information about FOBT. The overall rate of slide positivity for Hemoccult II was 3.7 percent (range 1.7 percent in patients, 40–49 years old to 6.6 percent for patients 70 years or older, nonhydrated). The predictive value of a positive slide for colonic neoplasia (adenoma or carcinoma) also correlated with age, increasing from 27 percent in the patients 40-49 years old to 52 percent in the group 70 years or older. During a specific period, Hemoccult II slides were hydrated prior to development with an increase in overall positivity rate to 5.4 percent with a coincident fall in predictive value from 44 percent to 19 percent. Because of this decrease in predictive value, Winawer argues against rehydration of slides during screening. Winawer also analyzed the number of Hemoccult II cards required per day to detect colonic neoplasma and showed that one smear per day would have detected only 41 percent of the lesions detected by two smears per day. For this reason, like Greegor,(*22*) he recommends that two tests be performed on each bowel movement.

Gilbertsen(*9*) has also initiated a long-term, large scale study to determine the true benefit of FOBT. Since 1975, 48,000 people aged 50-80 years have been randomized to either a control group, an annual FOBT group, or a biannual FOBT group. Although survival benefit, cost, and testing frequency await completion of the trial, certain facts are apparent from the preliminary data. Of the 32,000 patients in the two FOBT groups, 873 of the patients had positive tests (2.7 percent). Of the 873 patients with positive tests, 74 (8.5 percent) had colorectal cancer. In patients aged 63 years or older, hemoccult-positive stool led to the discovery of colorectal cancer in 12 percent. Of the malignancies, 78 percent were classified either as Dukes' A or B; only 5 percent had evidence of hepatic metastases. Barium enema (single contrast) were unreliable in the detection of colorectal neoplasms as only 64 percent of colonic carcinomas and 35 percent of colonic adenomas were detected by this method.

Conclusion

The recommendations of the American Cancer Society for screening of asymptomatic individuals with no known risk factors for colorectal carcinoma are based on the need to detect colorectal cancer at a stage where surgical cure is possible. These recommendations are likely to result in detection of a large number of asymptomatic colorectal cancers. Methods to increase sensitivity at this time are likely to decrease the predictive value of positive screening test results. Further efforts are required to improve the sensitivity and specificity of screening methods. Hemoquant testing and utilization of the flexible fiberoptic proctosigmoidoscope hold promise for the future. Continued efforts to develop risk factors for colorectal cancer may also serve to focus screening efforts more effectively.

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A First Year Student's Impression of OIS

ENS Theodore P. Chambers, MC, USNR

There was a time when most physicians and some dentists joining the Navy simply reported to a duty station upon receiving their first orders. Orientation to the Navy, its traditions, history, and regulations may have been limited to a trip to the uniform shop, where someone told them how to wear the uniform and gave them a brief lesson on how to salute. Well, times have changed.

The Navy, cognizant of a lack of military bearing among some of its staff corps personnel, initiated a program aimed at indoctrinating its newly recruited professionals. This program, the Officer Indoctrination School (OIS) in Newport, RI, is now going strong, providing for new physicians, dentists, nurses, lawyers, and other service professionals an orientation to the meaning of being an officer in the U.S. Navy.

OIS holds eight sessions each year. Since 1980 the school has graduated from 845 to 1,215 students per year, and in 1986 the school turned out over 1,700 graduates. Medical Corps and Nurse Corps comprised roughly half the students in 1985, with Medical Service Corps, Judge Advocate General Corps, and Dental Corps accounting for most of the other half. Nuclear power instructors and reactor engineers constitute the remainder. These students come from all parts of the United States, since the OIS is the Navy's only school of its kind.

The program lasts 6 weeks. Weekends are mostly free, but the weekday hours are almost fully scheduled from 0530 to 1700. The usual day begins at 0530 or 0600 with physical training (PT). Students muster 10 minutes before PT begins and march in ranks to Nimitz Field. Calisthenics, lasting roughly a half-hour, are mild but invigorating; they include push-ups, sit-ups, stretching exercises, and a brief jog of a half-mile progressing to 1½ miles. Students shower, go to Ney Hall for breakfast, and muster once more before marching to classes. Classes and drill run until about 1700 usually, with a lunch break at noon.

The core courses embody the major ideas which the school is trying to convey to the indoctrinees. The course called Leadership, Management Education, and Training (LMET) is a review of the basic principles underlying effective leadership and management. Although many students feel that too much time in the curriculum is devoted to this course, most agree that it is effective in heightening the student's awareness of his/her strengths and weaknesses as a leader. The course serves to make students understand that, as officers, they will be in a position of responsibility and will be providing role models for subordinates.

Administration and Career Development (ACD) is the course which provides instruction in the policies governing naval officers and enlisted personnel in regard to classification, detailing, rotation, pay, professional development, and promotion. From this description, it should be clear that ACD is a practical course which will make each OIS graduate's adjustment to Navy life much smoother.

Introduction to Military Law (MILAW) affords instruction in the fundamentals of naval justice and discipline. This course points out some of the more salient differences between civilian and military law, and it is effective in making the student aware of his/her responsibility as an officer to support and enforce naval law.

The rest of the weekday hours are devoted to drill instruction, a series of lectures called Naval Orientation, and the "track course," in which the student attends lectures by staff corps personnel in his/her particular field. (There are different track courses for medical, dental, law, nursing, and other students.) Introduction to Damage Control, probably the shortest course at OIS, is also among the most entertaining. Students receive instruction in the principles of response to and control of damage to a ship at sea. On Newport's *Buttercup,* an indoor trainer ship, students exercise newly acquired skills in damage control.

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The OIS experience is not limited to classwork, PT, and drill instruction. All students must qualify as second class swimmers. Olympics night, held in the third week of the program, is lighthearted athletic competition between companies in the OIS battalion. Greatly enjoyed by all students, Olympics night helps to build team spirit and gives students the chance to get to know each other in an atmosphere of levity.

For many students at OIS, the most valuable experience arises from the opportunity to take on one of the companies' leadership positions. Every week, each companies' OIS staff officer selects a new company commander, section leader, and two platoon leaders. These positions entail some responsibilities, and they require that the students taking them draw on their own resources and experience as leaders to take charge of a company of their own peers. In 1 week as company leaders, most students learn a great deal about themselves and about leadership.

A description of the OIS is incomplete without a word about how students spend their leisure time. Most evenings and weekends are free, and students try to take full advantage of what Newport, Providence, Cape Cod, and Boston have to offer. The summer months are undoubtedly the most enjoyable, with Newport's beaches, sailing, golf, and music festivals drawing many students. Boston's museums, night life, and baseball games at Fenway Park are major attractions as well.

On the final day at OIS there is a pass-in-review followed by a graduation ceremony. Each student is awarded a certificate for completion of the 6-week program. There is a trophy for the platoon with the best performance in close order drill maneuvers at pass-in-review. Awards are given the highest grade point average, outstanding achievement in military readiness and outstanding leadership qualities. The three major individual awards are Honor Award, Alfred Award, and Leadership Award. Other students are recognized with letters of commendation for excellence in physical fitness, military bearing, and academics.

One question remains to be addressed: How do OIS students feel about the program? The majority find it a positive and worthwhile experience. In fact, many are surprised at how enjoyable the program is. There are complaints, however, as anyone would expect. They are the same complaints heard in any military orientation or training program, about food, lack of sleep, problems adjusting to the military, endless classes, etc.

At the end of the session, almost all students expressed the feeling that the program was very helpful and, frankly, a great time. Many of those who go through OIS will be practicing Navy medicine, law, or dentistry together in the future, and no one can describe the strength of the camaraderie that evolves from shared experiences at Newport.

Regarding the program's actual intentions, most of the students are content. They are grateful to the Navy for having offered a program which helps orient them to "the Navy way." They enjoy learning about naval history and tradition. In short, students at OIS not only come to understand the meaning of being an officer but they also learn how to bear the title of naval officer responsibly.

OIS benefits the Navy in one other way. Today, American physicians are often criticized for their inability to relate to patients. With their years of higher education and intense professional training, many physicians, it is felt, have lost touch with those they treat. This may impair the doctor-patient relationship and interfere with therapy. The Navy has devised a program which might narrow that gap of understanding between its doctors and its line officers and sailors. At OIS newly recruited medical students and doctors get a taste of what every line officer and sailor must undergo before being accepted as part of the Navy.

OIS is not as demanding as Officer Candidate School (OCS) and basic training, but students do experience some of the rigors of these other schools. They understand what it's like to wake up at 0430 to prepare their rooms for inspection. They know how it feels to put all their energy into personnel inspection, only to fail because the "gig line" is off a bit or the visor has lint visible only to the inspector. These experiences have nothing to do with the science of medicine, but they can go a long way to improve the Navy physician's understanding of and rapport with his patient.

The OIS program is in constant evolution as it moves toward meeting the needs of the Navy and the individual officer. It has very competent staff dedicated to making the school as effective as possible in fulfilling the program's objectives. Because of the Officer Indoctrination School, the Navy is producing a new breed of staff corps personnel to support the line. Doctors and other professionals in tomorrow's Navy will find it easier to adjust to Navy life. More importantly, these officers, by virtue of their OIS orientation, will be better prepared to serve the Navy. □

Patient Evacuation Clerks

The Armed Services Medical Regulating Office (ASMRO) and the 57th Aeromedical Evacuation Squadron (57th AES) have recently initiated monthly classes at Scott AFB, IL, for patient evacuation clerks. This is an excellent method to keep patient administration personnel abreast of medical regulating and patient movement procedures. In addition, personnel may request Invited Medical Personnel (IMP) status which allows individuals to fly aboard a C-9 aircraft to and from Scott AFB to attend classes and receive orientation to the Military Airlift Command domestic aeromedical evacuation system. Accommodations are usually available on base so TAD costs are kept to a minimum.

For more details contact SFC Mindy Bryan at ASMRO. Telephone: Autovon 576-6161, Commercial (618) 256-6161. Attendance is encouraged.

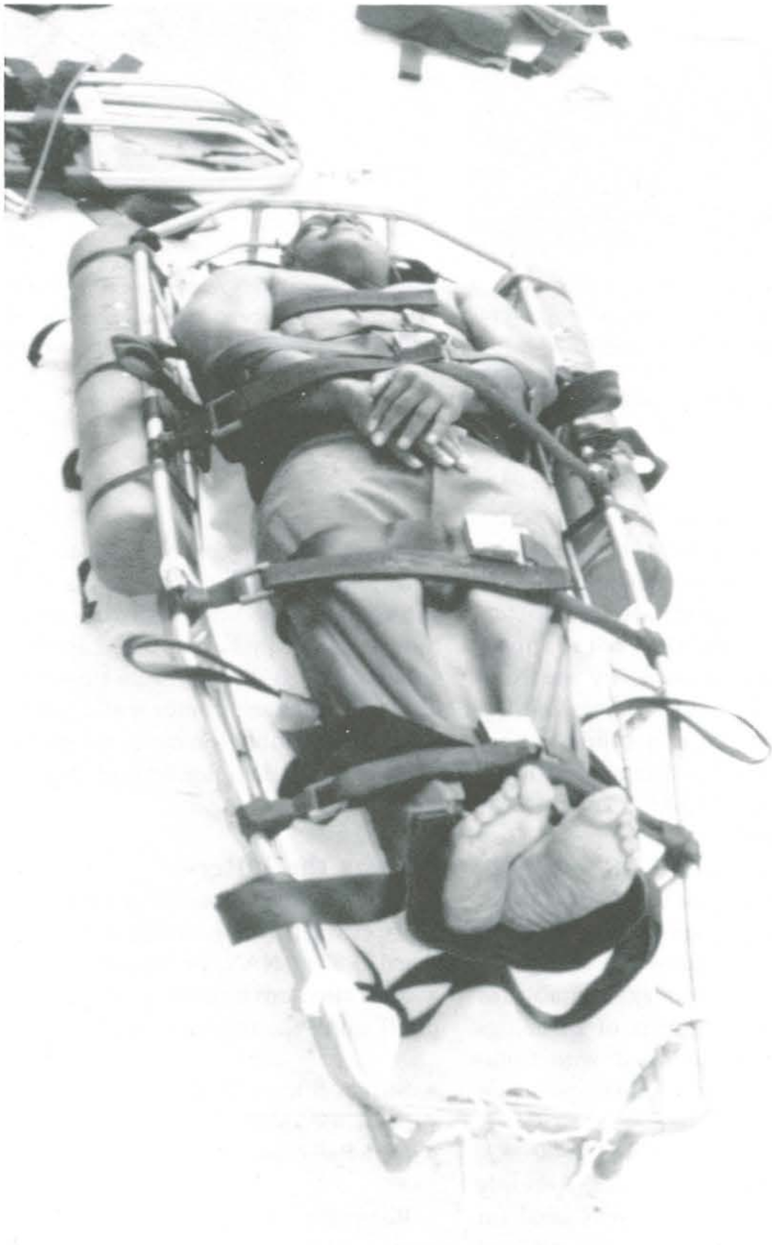
Compatibility of Navy Litters

CAPT B.L. Ozment, MSC, USN
AFCM J.F. Kelly, USN

Helicopter Combat Support Squadron Sixteen, the Navy's Search and Rescue (SAR) Model Manager, recently tested compatibility and flotation characteristics of two combinations of standard litters used in helicopter hoisting and ship-to-ship transfers of patients. Our prime concern was to determine if the buoyancy characteristics were affected or degraded when these litters are used in conjunction with one another.

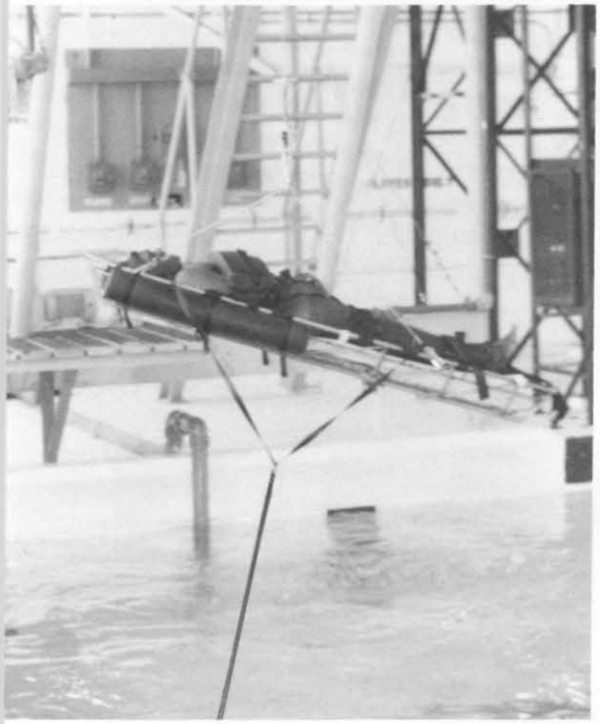
The Litters

The first litter of concern is NSN 6530-00-783-7600, Litter, semirigid, poleless (or Neil-Robertson). In use aboard ship since the 1940's, this litter is constructed of canvas, with integral wood stiffeners or battens. The patient is secured by wrapping/strapping in place. A removable and adjustable hood serves as a head restraint and completes the immobilization process. The litter can be hoisted vertically using an attached hoisting strap/ring assembly. It can also be carried horizontally by four litter-bearers. The Neil-Robertson is the litter of choice for moving a casualty from below decks, especially when narrow vertical trunks and hatches are involved. It is also useful for full-body immobilization when a spinal or intercranial injury is suspected. The Neil-Robertson is not, however, designed

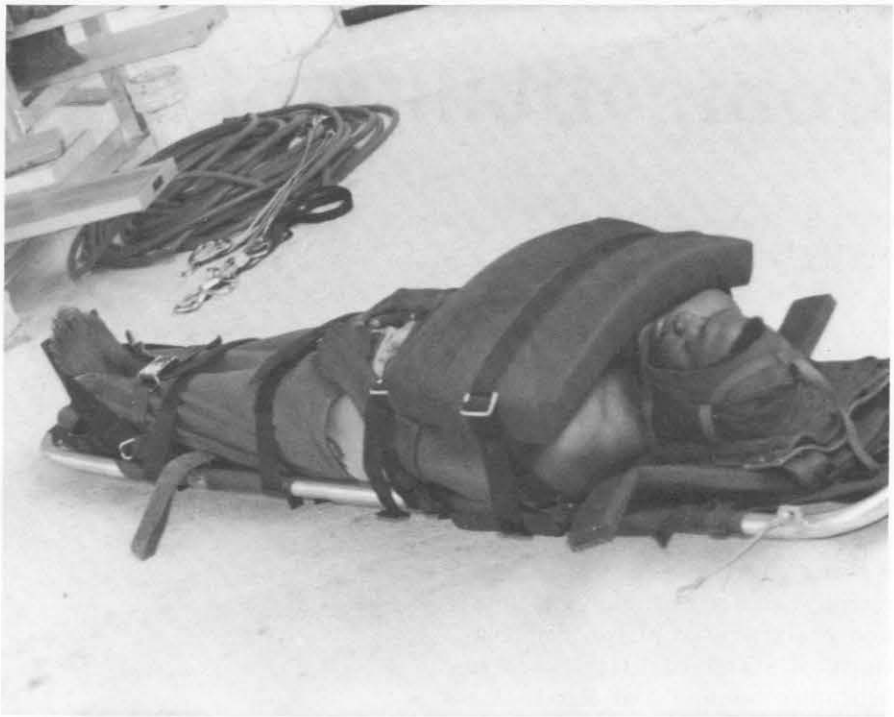


The Neil-Robertson used with the Stokes litter. Note flotation pads on sides of the Stokes. An additional flotation pad is strapped across the patient's chest prior to ship-to-ship transfer via high line.

CAPT Ozment is commanding officer of the Naval Medical Materiel Support Command, Ft. Detrick, MD 21701-5015. AFCM Kelly is attached to Helicopter Combat Support Squadron Sixteen.



Stokes/Neil-Robertson combination rigged for overwater transfer. Note flotation chest pad in place and the hoisting sling assembly in use. "Y" trail line maintains stability of litter while moving from ship to ship.



SAR medevac/Neil-Robertson litter combination with chest pad flotation rigging. Note how the Neil-Robertson head restraint hood constrasts with the mechanism provided with the SAR medevac litter. The latter mechanism is folded beneath the SAR medevac litter.

for transferring patients between ships via high-line, or for helicopter hoisting, since it has no flotation characteristics. Due to the total body immobilization allowed by the Neil-Robertson, it may, on occasion, be desirable to use it as a splint, in conjunction with other litters, specifically the wire basket (Stokes), or the SAR medevac litter.

The second litter is NSN 6530-00-181-7767, Stokes, or wire basket litter. Comprised of a rigid metal frame and wire fabric, forming an elongated basket shape, the Stokes is suitable for above decks movement of casualties aboard ship. Configured with flotation pads, it can be used in ship-to-ship transfers via high line.

The third litter is NSN 6530-00-187-0104, SAR Medevac Litter. Recently introduced to the fleet, it is ideal for vertical hoist or high-line transfer of patients. Compact and simple to assemble, it stores easily aboard ship and is impervious to the shipboard environment. It was recently added to the allowances for all surface ships and submarines. The litter easily traverses most hatches, including those aboard submarines. It has built-in flotation characteristics and comes with a hoisting sling assembly for use in moving a casualty via helicopter or high line.

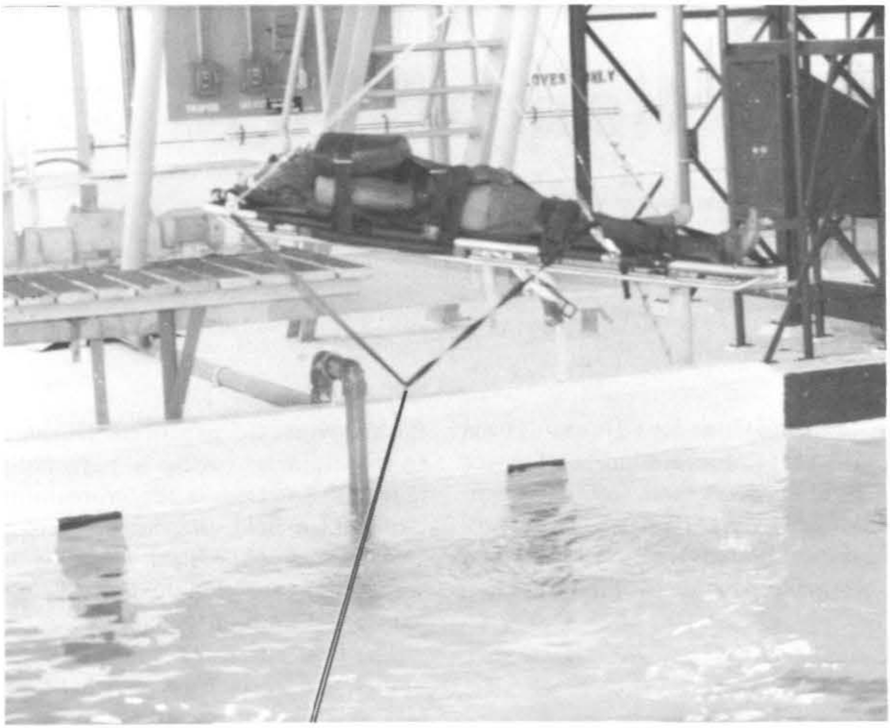
Testing the Litters

The Neil-Robertson litter compatibility evaluation was conducted on 15 April 1986 at NAS, Pensacola, FL, in a controlled environment (swimming pool) using the following equipment:

- Stokes litter with flotation
- SAR medevac litter with flotation
- Neil-Robertson litter

Both the Stokes and the SAR medevac litters were configured with a Neil-Robertson and tested with a patient. The following results were obtained:

- Both the Stokes and SAR medevac litters easily accommodated the Neil-Robertson litter.
- The patient restraint strap on both the Stokes and SAR medevac were easily accessible and there were no problems in securing the patient in either litter.
- The vertical lifting strap and lifting ring on the Neil-Robertson are not used when coupled with the Stokes/SAR medevac litters. They should be stowed beneath the head of the Neil-Robertson to prevent them from striking the patient on the face.
- Since personal flotation cannot be worn by a patient secured in the Neil-Robertson, the chest-pad flotation assemblies must be attached on the Stokes/SAR medevac litter chosen for use with the Neil-Robertson. This ensures maximum freeboard, keeping the patient's head above water in the event of a mishap.
- When the Neil-Robertson is coupled with the SAR medevac litter,



SAR medevac/Neil-Robertson litter combination rigged for overwater transfer (ship to ship), using hoisting sling assembly provided with the SAR medevac litter. Similar rigging would be employed for helicopter hoist. Note "Y" trail assembly for stability in ship-to-ship transfer.

Stokes/Neil-Robertson and SAR medevac/Neil-Robertson combinations afloat in swimming pool with a 180- to 200-pound "patient."

the head restraint system on the latter cannot be used. The head restraint should be folded outboard to provide a low profile inside the SAR medevac litter.

- Buoyancy characteristics of neither the flotation rigged Stokes litter nor the SAR medevac litter were adversely affected when they were coupled with the Neil-Robertson and placed in the swimming pool.
- The Neil-Robertson is compatible both with the Stokes and SAR medevac litters. In both configurations, the litters maintained positive buoyancy and the self-righting ability of neither was compromised.
- Due to the narrow profile of the Neil-Robertson, it was easily maneuvered and secured into the Stokes and SAR medevac litters, and did not hinder the use of hoisting sling assemblies on either litter.

This report should benefit corpsmen and medical officers serving in small ships, where at-sea transfer of patients most often occurs. Preparation is the key to success. Periodic drills will ensure readiness for helicopter hoist or high-line transfer of the sick and injured. Familiarity with litters is essential. Patient securing devices, hoisting sling assemblies, etc., should always be in proper working order. Flotation rigging of the Stokes litter is a local command responsibility. The SAR/medevac litter is relatively new to the fleet. When received aboard ship, the medical department representative should quickly learn to use it.

The authors are aware of undesirable characteristics in the Neil-Robertson litter currently in use. Chiefly these are: (1) tendency of the cotton fabric/straps to dry-rot, and (2) tendency of the wooden stiffeners to break easily. Yet a serviceable Neil-Robertson litter remains the best means of extricating an injured individual from below decks, especially when vertical trunks or hatches are involved. Likewise, the Neil-Robertson may be satisfactorily employed as a splinting mechanism, inside either the Stokes or SAR medevac litters, in cases involving skeletal injury.

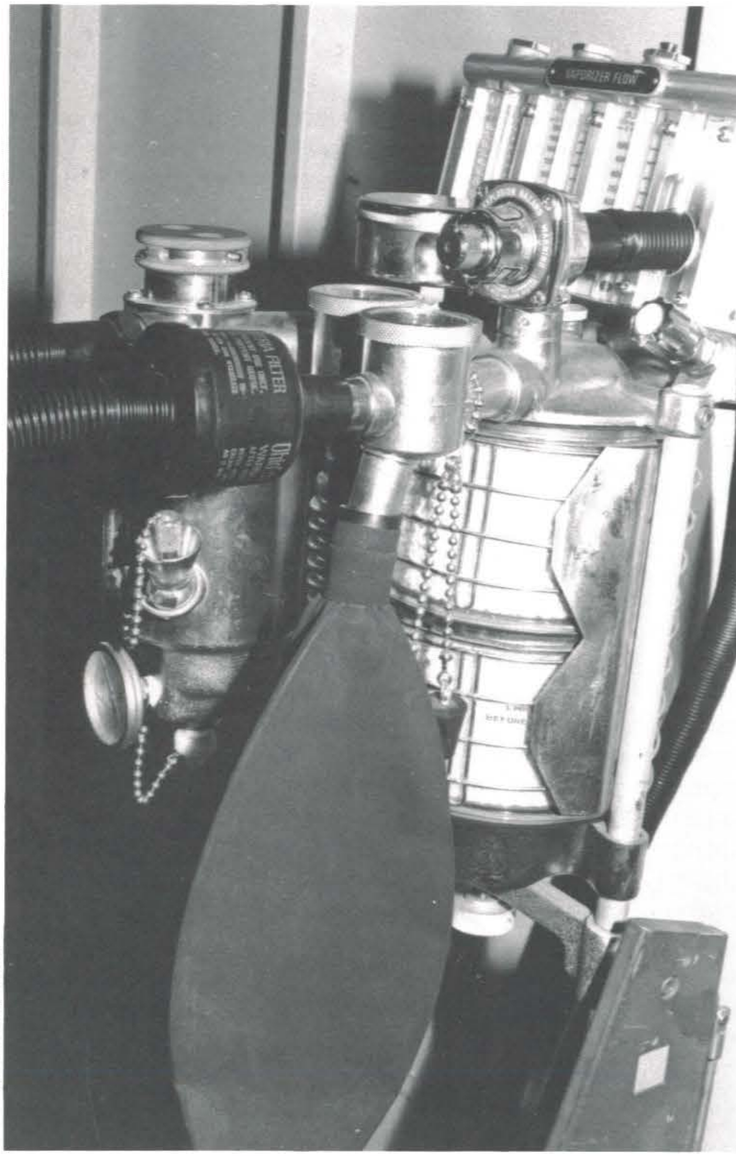
The Commanding Officer, Naval Medical Materiel Support Command, has requested that Defense Personnel Support Center (DPSC) change the specifications for the Neil-Robertson litter, to require use of synthetic fabrics in the body of this litter as well as associated straps. Additionally, DPSC has been requested to explore use of materials other than wood in the stiffeners used with this litter. As more information becomes available, it will be provided in the monthly *Navy Medical and Dental Materiel Bulletin.*

Reader comments and recommendations on matters discussed in this article are welcomed. Address any correspondence related to this article to: Commanding Officer, Naval Medical Materiel Support Command, Fort Detrick, MD 21701-5015. □

Hidden Obstruction of Field Anesthesia Machine

LCDR John G. Bendele, NC, USN LT William L. Chester, MC, USNR

An ever-increasing number of Medical Department officers are being introduced to a field anesthesia machine during contingency training programs. Rapidly Deployable Medical Force (RDMF), Mobile Medical Augmentation Readiness Team (MMART), Field Medical Service School (FMSS), and Combat Casualty Care Course (C-4) all offer familiarization and/or training with a field anesthesia machine for Medical, Dental, and Nurse Corps officers. During a recent training course a potentially lethal obstruction in the rebreathing circuit of a field anesthesia machine was discovered. A black rubber plug was found to occlude completely the exhalation limb of the circuit.



Photos by PH3 Gary Tucker

Figure 1

The field anesthesia machine commonly used by the Navy in field hospitals, surgical blocks, and soon to be predeployed on helicopter carriers, is the Ohio Medical Products: Model 885 Conversion, "Anesthesia Apparatus, Gas, Nitrous Oxide, and Volatile Liquid Anesthetics, Portable 4 Cylinder Capacity," national stock number: 6515-01-003-4133.

Anesthesia providers will recognize this machine as very basic, with a delivery system that includes a rebreathing circuit (circle system) with carbon dioxide absorber. Figure 1 shows the familiar attachment of breathing hoses and breathing bag to this machine. Unlike many anesthesia machines in use today, the volatile anesthetic is added to the circuit between the inhalation and exhalation check valves. A schematic of the Adult Rebreathing Circuit is reprinted from the field anesthesia machine *Instruction and Service Manual* (see Figure 2). Note the position of the liquid anesthetic vaporizer is "down stream" from the inhalation check valve.

In order to provide a source of gas and anesthesia mixture to a partial rebreathing system such as a Mapleson "D," independent of the circle system

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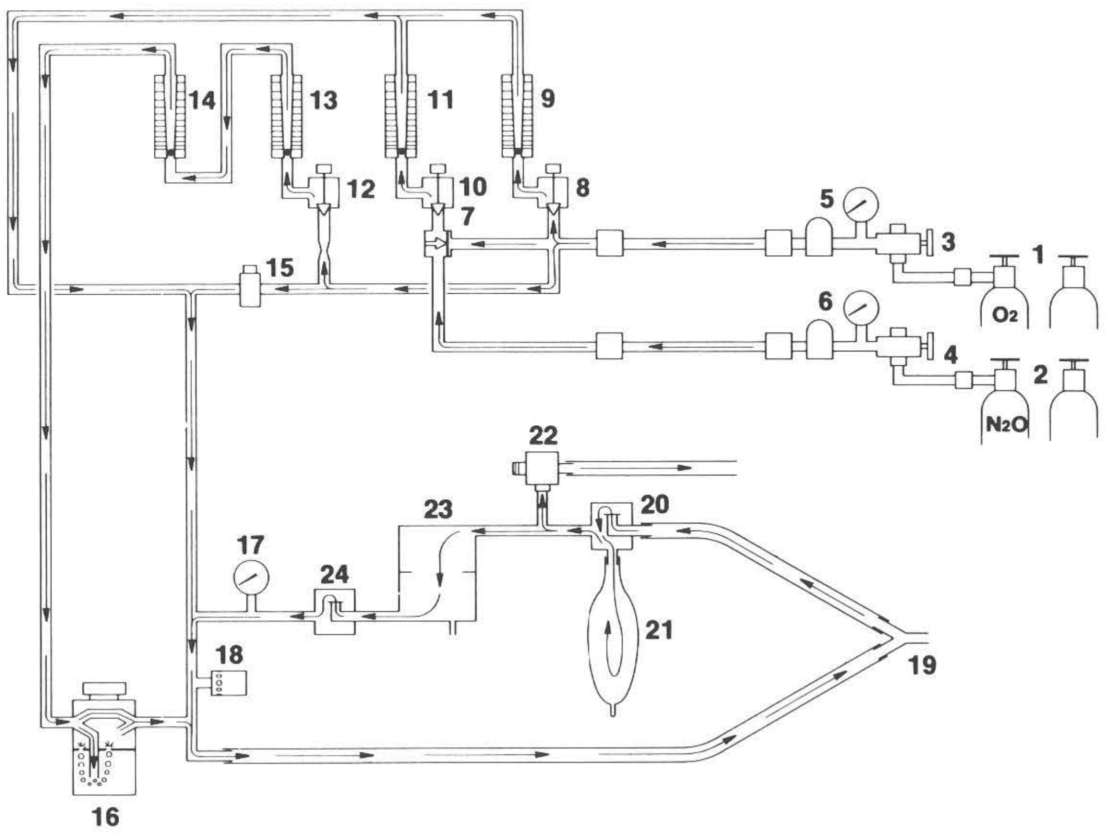


1. O_2 Cylinder
2. N_2O Cylinder
3. O_2 Cylinder Adapter
4. N_2O Cylinder Adapter
5. O_2 Regulator
6. N_2O Regulator
7. Pressure Sensor Valve
8. O_2 Needle Valve
9. O_2 Flowmeter
10. N_2O Needle Valve
11. N_2O Flowmeter
12. O_2 for Vaporizer Needle Valve
13. O_2 for Vaporizer Flowmeter (low flow)
14. O_2 for Vaporizer Flowmeter (high flow)
15. O_2 Flush Valve
16. Anesthetic Vaporizer
17. Patient Circuit Pressure Gauge
18. Pressure Relief Valve (non-adjustable)
19. "Y" Connector
20. Exhalation Check Valve
21. Breathing Bag (3 Liter)
22. Gas Evacuator/Relief Valve
23. Absorber
24. Inhalation Check Valve

Adult/Rebreathing Circuit

Figure 2

Ohio Medical Products

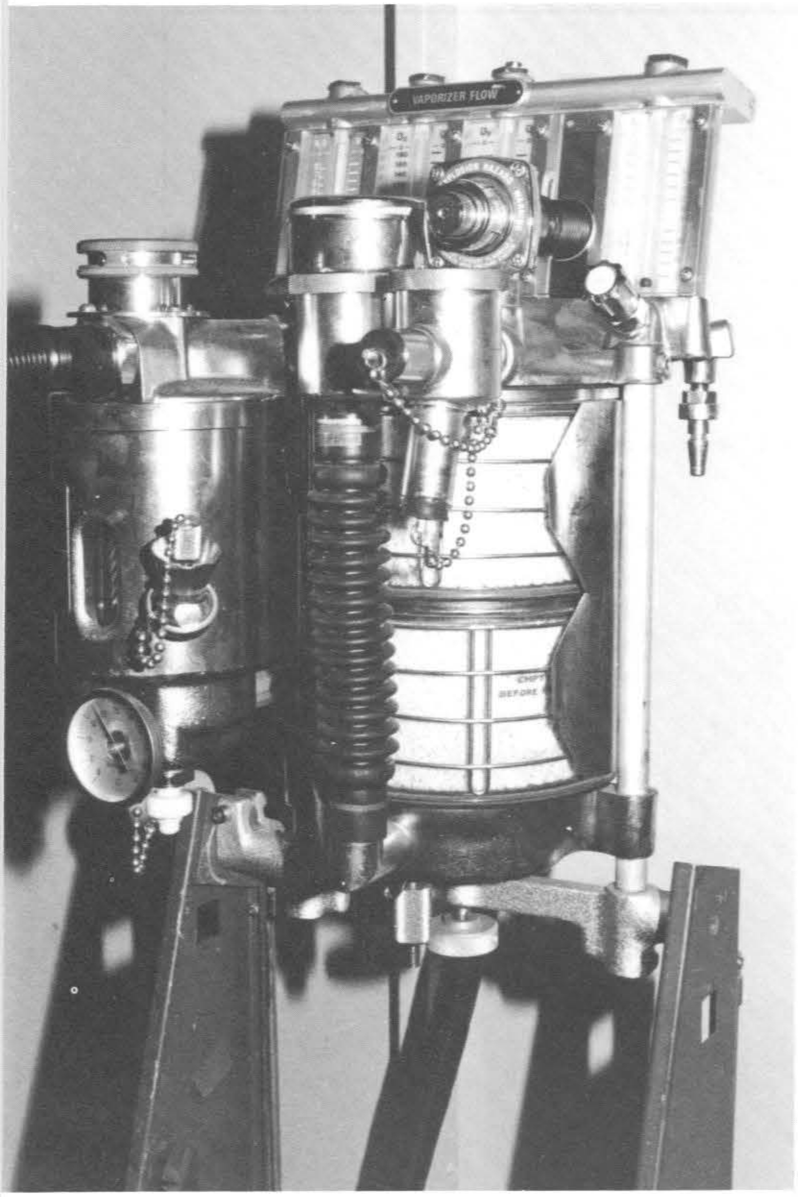
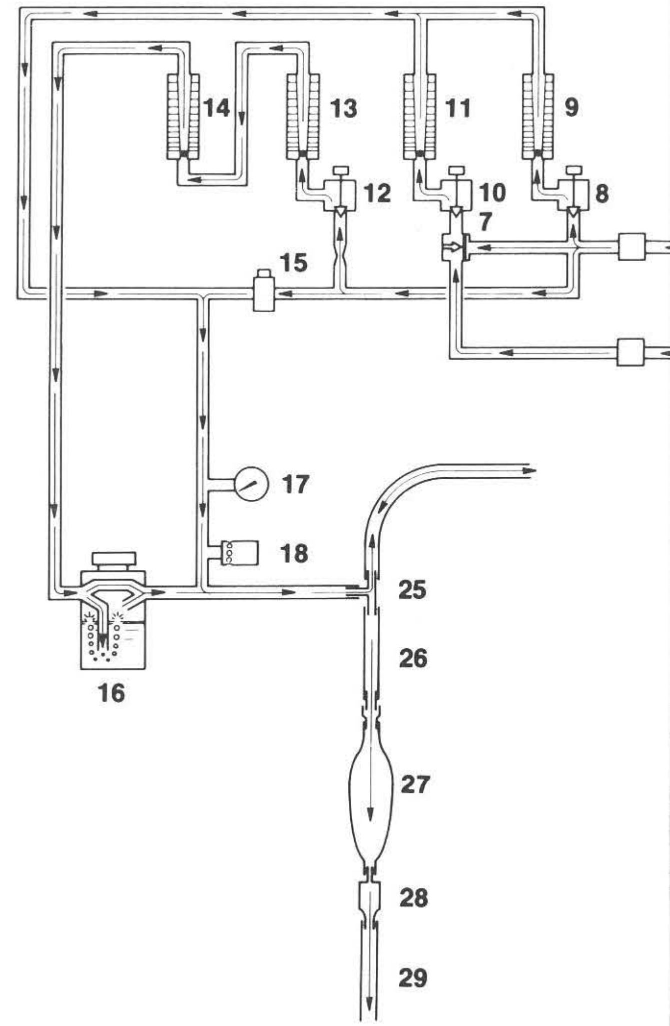


Figure 3

and absorber, the breathing bag tube and the exhalation tube must be blocked. This machine comes with two black rubber plugs attached by short chains for this specific purpose. When these plugs are correctly placed, as in Figure 3, the machine becomes a delivery system only. Figure 4 demonstrates the machine configured to supply a Jackson-Reese modification of the Mapleson "D" system.

The obstruction caused by the rubber plug has been reconstructed in Figure 5. Note that the plug has been freed from its chain and jammed into



1. O_2 Cylinder
2. N_2O Cylinder
3. O_2 Cylinder Adapter
4. N_2O Cylinder Adapter
5. O_2 Regulator
6. N_2O Regulator
7. Pressure Sensor Valve
8. O_2 Needle Valve
9. O_2 Flowmeter
10. N_2O Needle Valve
11. N_2O Flowmeter

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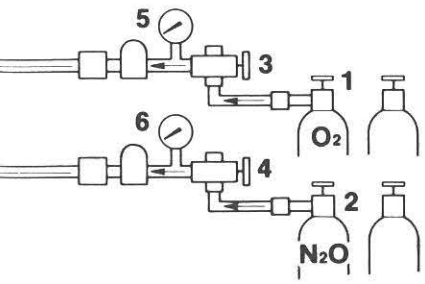
Figure 4

Ohio Medical Pro



O_2 for Vaporizer Needle Valve
O_2 for Vaporizer Flowmeter (low flow)
O_2 for Vaporizer Flowmeter (high flow)
O_2 Flush Valve
Anesthetic Vaporizer
Patient Circuit Pressure Gauge
Pressure Relief Valve (Non-adjustable)
Pediatric TEE Connector
Breathing Tube, Corrugated (Short)
Breathing Bag (1 liter)
Scavenging Valve, Adjustable Orifice
Gas Evacuation Tubing

: Items 19 through 24 appear in Figure 10.

iatric/Partial-Rebreathing Circuit

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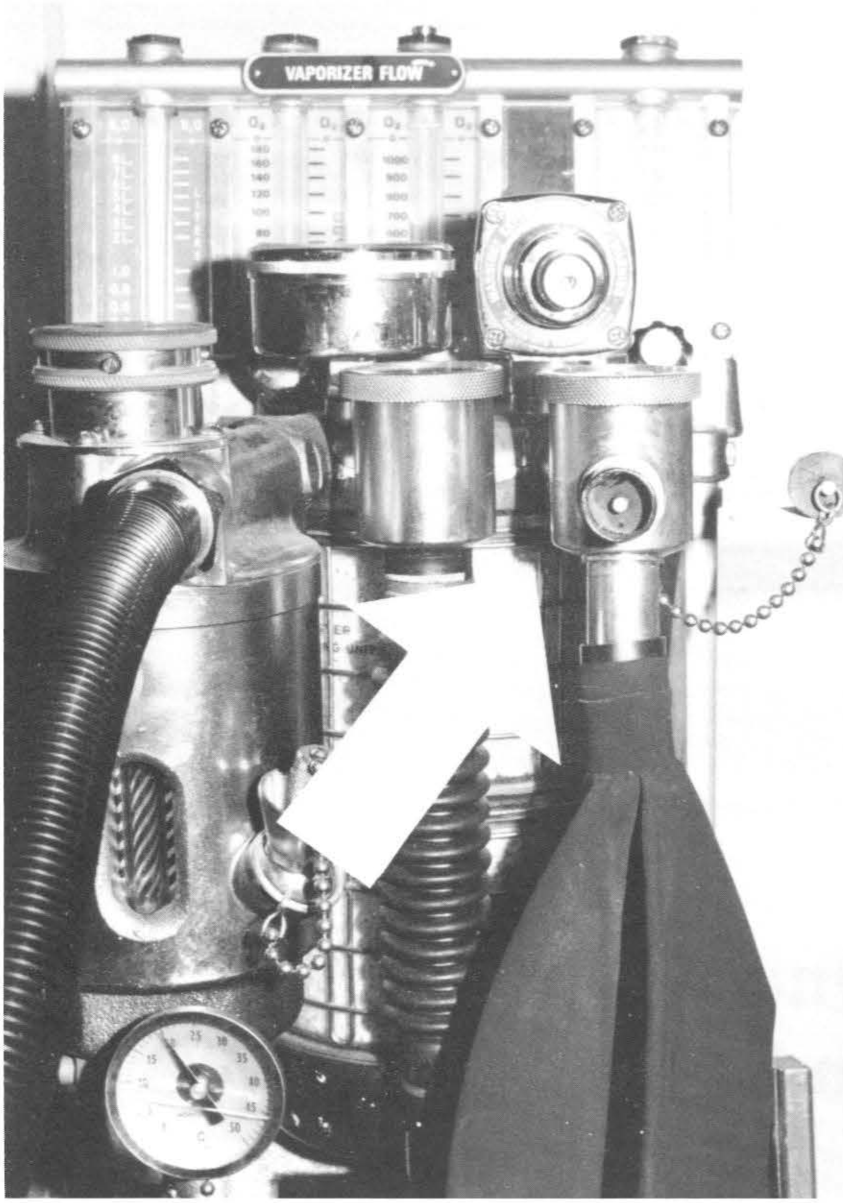
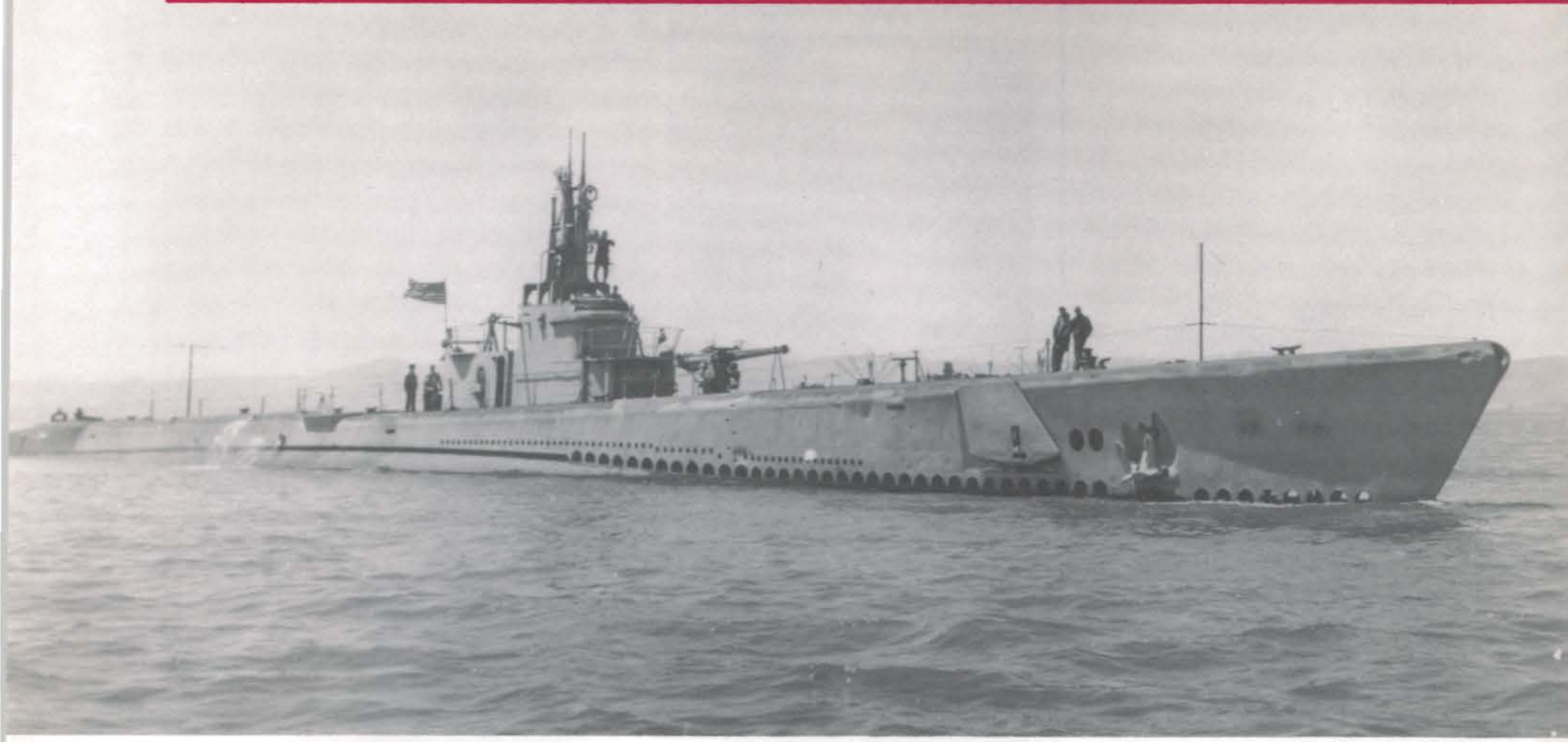


Figure 5

the exhalation tube lumen. Next to the exhalation tube is a similar rubber plug shown for comparison. With the circle system in place, it is impossible to see this obstruction (Figure 1). The breathing bag lumen could be obstructed in the same manner.

The potentially lethal obstruction was found during a machine checkout used by both authors. Although this technique is controversial, we routinely fill the circle system with oxygen and, after checking for leaks, place the anesthesia mask over our surgical mask and ventilate several times while we watch for proper functioning of the check valves. The inability to exhale into the system and the lack of movement of the exhalation check valve led to the discovery of the obstructing plug. When the plug was removed, the rebreathing capability of the circuit was restored.

In addition to a thorough machine check for proper function, this potential problem could be prevented by making the rubber plugs larger so only the tapered smaller end would insert in the tubes or use plugs with a flange extending beyond the larger end. □



USS Seadragon *(SS-194)*

United States Naval Institute

One Merchant Ship, One Oil Tanker, and One Successful Appendectomy

One of the most dramatic stories to come out of World War II recounted an emergency operation performed by a 23-year-old corpsman as his submarine, USS Seadragon, *cruised submerged in enemy waters. Related in a 1942 newspaper article, the story brought a Pulitzer Prize to journalist George Weller and fame to Pharmacist's Mate Wheeler B. Lipes. It also gave a much needed dose of inspiration to the homefront when good news about the war was hard to come by.*

Over the years, the episode became legend, providing drama for such Hollywood productions as "Destination Tokyo" and "Run Silent, Run Deep." Our reprinting of the original article in the July-August 1986 U.S. Navy Medicine *has generated tremendous interest among our readers. Many wanted to know what became of the young surgeon and his patient.*

Wheeler B. Lipes retired from the Medical Service Corps in 1962. He then became chief executive officer of the 1,000-bed Memphis hospital which serves as the teaching facility for the University of Tennessee. Now president of Memorial Medical Center in Corpus Christi, TX, Lipes recently spoke to U.S. Navy Medicine *about his half-century career in health care and the submarine appendectomy that made him a reluctant hero nearly 45 years ago.*

USNM: When did you join the Navy?

Mr. Lipes: In 1936. I was in a long time before the war broke out. I had been on the old battleship *Texas* before I went to the Naval Hospital in Philadelphia. From there to Canacao near Manila. In October of '41 I went into submarines.

How did that happen?

One day I just decided I wanted submarines. The personnel officer thought I had a hole in my head. There weren't any subs available then but I went looking for one and eventually got aboard the *Sealion.* The *Sealion* and *Seadragon* were sister ships. The *Sealion* was almost finished with its overhaul and the two subs were tied alongside one another at the Cavite Navy Yard. When the bombers came at noon on the 10th of December [1941] they just leisurely wiped out the yard. One bomb went right down the after engine room hatch. The shrapnel from that one killed some people on the *Seadragon*'s conning tower and punched holes in her pressure hull. I was in the water for awhile and was picked up on the perimeter of the navy yard late that night with the yard burning and exploding. The *Seadragon*'s pharmacist's mate was slightly wounded in the arm by shrapnel and he transferred himself off the sub, which left a vacancy. I was the logical choice to replace him. My escape from the Philippines was made possible by that event.

How many patrols did you participate in?

About five as I recall. Formosa, Camranh Bay. We were in the blockade of New Britain, New Ireland, Java, Java Sea, and in on all the initial efforts to hold back the Japanese and keep our finger in the dike until reinforcements arrived. As part of a squadron of submarines that was feeding Bataan, we would leave our torpedoes, except those in the tubes, in Cebu, take on 40-60 tons of food, and run it into Corregidor. As Bataan was being overrun we were taking people off Corregidor.

What actually happened on the *Seadragon* back in September 1942?

I had been up on watch and when I came down to the after battery section of the submarine—the crew's compartment—I found Darrell Rector. It was his 19th birthday. He said to me, "Hey Doc, I don't feel very good." I told him to get in his bunk and rest a bit and kept him under observation. His temperature was rising. He had the classic symptoms of appendicitis. The abdominal muscles were getting that washboard rigidity. He then began to flex his right leg up on his abdomen to get some relief. He worsened and I went to the CO to report his condition. The skipper went back and talked to Rector explaining that there were no doctors around. Rector then said, "Whatever Lipes wants to do is OK with me." The CO and I had a long talk and he asked me what I was going to do. "Nothing," I replied. He lectured me about the fact that we were there to do the best we could. "I fire torpedoes every day and some of them miss," he reminded me. I told him that I couldn't fire this torpedo and miss. He asked me if I could do the surgery and I said yes. He then ordered me to do it.

When I got to the appendix, it wasn't there. I thought, "Oh my God! Is this guy reversed?" There are people like that with organs opposite where they should be. I slipped my finger down under the cecum—the blind gut—and felt it there. Suddenly I understood why it hadn't popped up where I could see it. I turned the cecum over. The appendix, which was 5 inches long, was adhered, buried at the distal tip, and looked gangrenous two-thirds of the way. What luck, I thought. My first one couldn't be easy. I detached the appendix, tied it off in two places, and then removed it after which I cauterized the stump with phenol. I then neutralized the phenol with torpedo alcohol. There was no penicillin in those days. When you think of what we have in the armamentarium today to prevent infection, I marvel.

You did have sulfa, didn't you?

We had some tablets that I ground into a powder and then put in the oven to kill any spores. This was all I had. I had given this kid a 3-inch incision, yet he healed well and was back on duty in a few days. In fact, the ship's cook said, "Doc, you must have sewed him up with rubber bands, the way he eats."

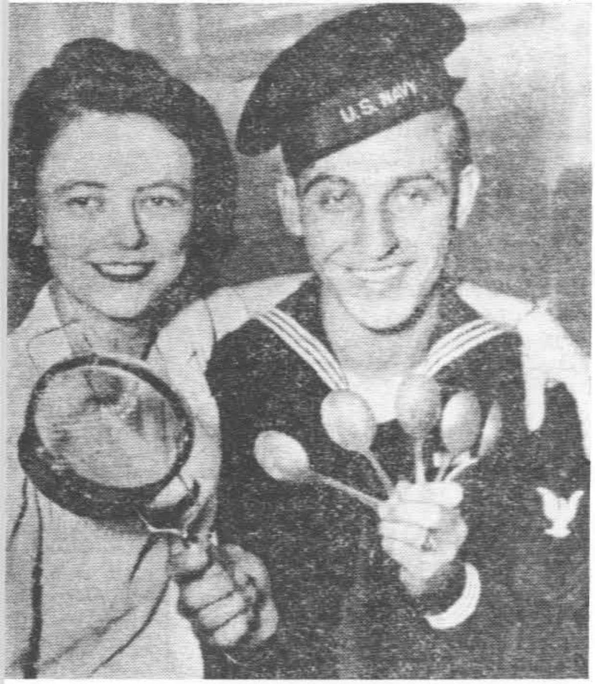
Obviously, this was not the first time you had seen such an operation.

Oh, no. I assisted many times in the OR. In fact, the day I was to leave the Naval Hospital at Canacao, a doctor I had worked with, Carey Smith, came over to me and said, "You never know what's going to happen in a submarine. One of the things you may face is

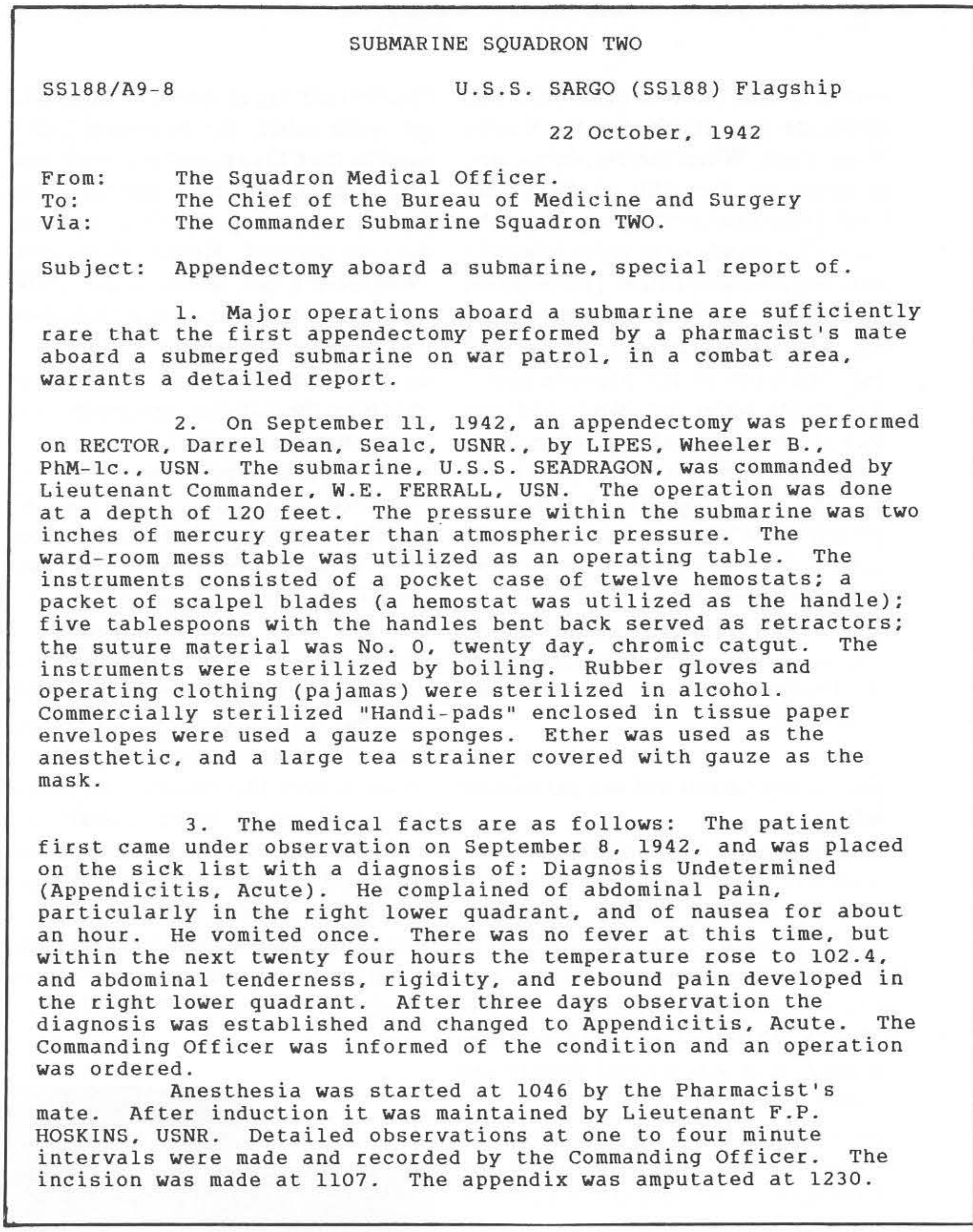
HM1 Frank Passalacqua

Wheeler Lipes in his Memorial Medical Center office.

Courtesy Wheeler B. Lipes



In this vintage photo, Lipes displays the everyday kitchen implements he used in performing his historic operation. Right: *Submarine Squadron Two Medical Officer Thomas G. Walsh reports the submarine appendectomy to BUMED.*



SUBMARINE SQUADRON TWO

SS188/A9-8 U.S.S. SARGO (SS188) Flagship

22 October, 1942

From: The Squadron Medical Officer.
To: The Chief of the Bureau of Medicine and Surgery
Via: The Commander Submarine Squadron TWO.

Subject: Appendectomy aboard a submarine, special report of.

1. Major operations aboard a submarine are sufficiently rare that the first appendectomy performed by a pharmacist's mate aboard a submerged submarine on war patrol, in a combat area, warrants a detailed report.

2. On September 11, 1942, an appendectomy was performed on RECTOR, Darrel Dean, Sealc, USNR., by LIPES, Wheeler B., PhM-1c., USN. The submarine, U.S.S. SEADRAGON, was commanded by Lieutenant Commander, W.E. FERRALL, USN. The operation was done at a depth of 120 feet. The pressure within the submarine was two inches of mercury greater than atmospheric pressure. The ward-room mess table was utilized as an operating table. The instruments consisted of a pocket case of twelve hemostats; a packet of scalpel blades (a hemostat was utilized as the handle); five tablespoons with the handles bent back served as retractors; the suture material was No. 0, twenty day, chromic catgut. The instruments were sterilized by boiling. Rubber gloves and operating clothing (pajamas) were sterilized in alcohol. Commercially sterilized "Handi-pads" enclosed in tissue paper envelopes were used a gauze sponges. Ether was used as the anesthetic, and a large tea strainer covered with gauze as the mask.

3. The medical facts are as follows: The patient first came under observation on September 8, 1942, and was placed on the sick list with a diagnosis of: Diagnosis Undetermined (Appendicitis, Acute). He complained of abdominal pain, particularly in the right lower quadrant, and of nausea for about an hour. He vomited once. There was no fever at this time, but within the next twenty four hours the temperature rose to 102.4, and abdominal tenderness, rigidity, and rebound pain developed in the right lower quadrant. After three days observation the diagnosis was established and changed to Appendicitis, Acute. The Commanding Officer was informed of the condition and an operation was ordered.

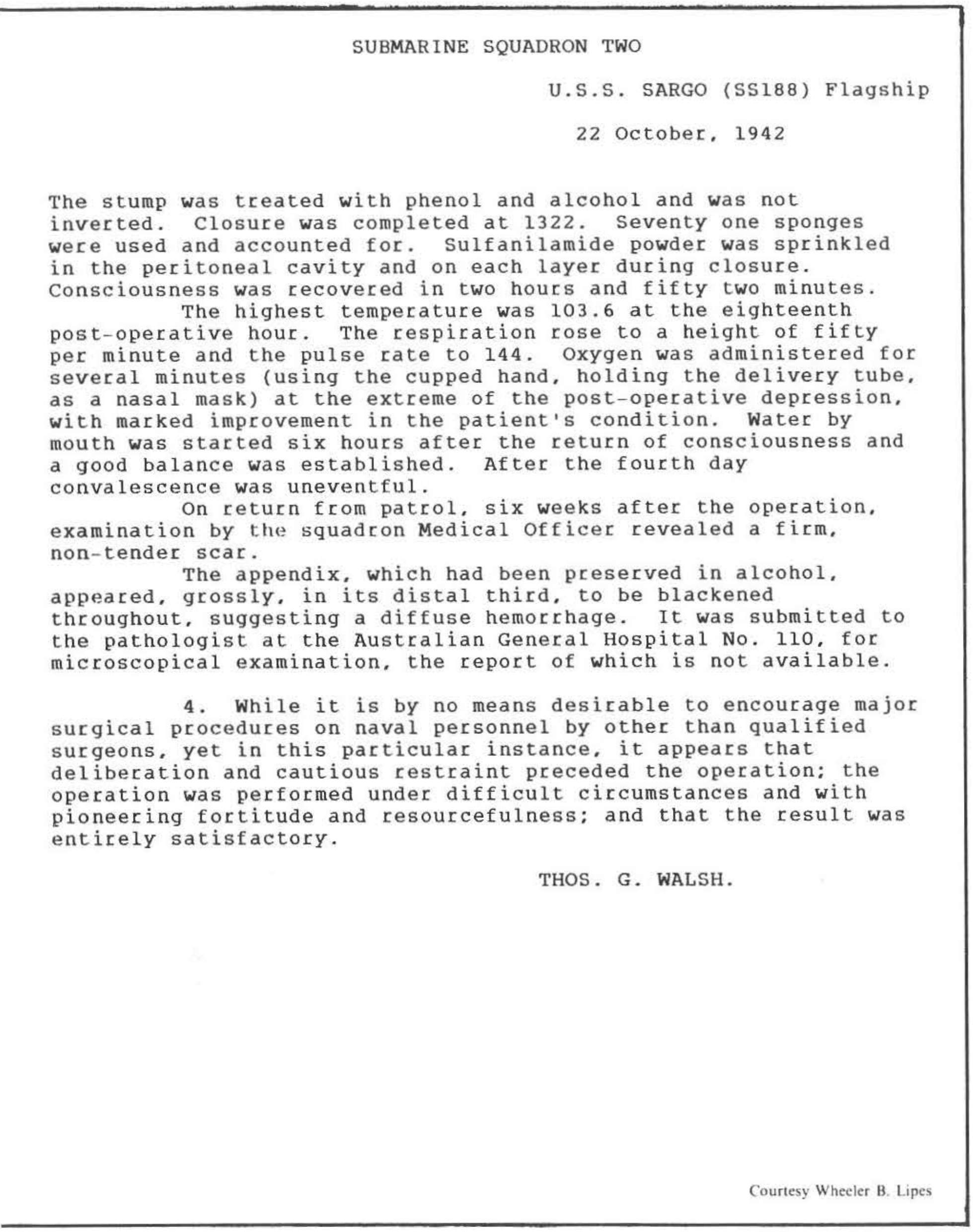
Anesthesia was started at 1046 by the Pharmacist's mate. After induction it was maintained by Lieutenant F.P. HOSKINS, USNR. Detailed observations at one to four minute intervals were made and recorded by the Commanding Officer. The incision was made at 1107. The appendix was amputated at 1230.

appendicitis. Never use a purse-string closure." I remembered that advice.

What was the general reaction to your successful surgery?
After we submitted our report, there was a great deal of consternation in the Bureau of Medicine and Surgery. Everyone did then exactly what they would probably do now. They reacted to a situation they knew absolutely nothing about. There was an old warrant officer I knew back at BUMED who was on duty the night the message came in about the operation. He told me later how much trouble I had caused him. There were many doctors back there who were very upset about what I had done. I guess they were afraid that because I had performed an appendectomy everyone in the fleet would be running around looking for the first opportunity to do one. They forgot there were commanding officers and you had supervisory chains that would preclude this.

Were you ever officially recognized for having performed the operation?
The day I retired I got one of those canned retirement letters signed by the Surgeon General. It gave me credit for bravery in action during the sinking of the submarine *Sealion.* Yet neither it nor any document I ever received mentioned the appendectomy. Not that that incident in itself was so important. What was important was that I did my job and saved the guy's life. It was my job to do anything I could to preserve life and, really, I didn't deserve special credit or recognition for doing that. However, since the incident had gone so far to give the Navy good publicity and to present to the public the fact that Navy men were well trained and dedicated, the omission was that much more evident.

I think the whole point of that operation was not that I did it. It was the fact that those hospital corpsmen on independent duty had been so well trained. It was proof that the Navy's training program was tested and found to be effective. There was a hard core group of hospital corpsmen and pharmacist's mates in those days who



SUBMARINE SQUADRON TWO

U.S.S. SARGO (SS188) Flagship

22 October, 1942

The stump was treated with phenol and alcohol and was not inverted. Closure was completed at 1322. Seventy one sponges were used and accounted for. Sulfanilamide powder was sprinkled in the peritoneal cavity and on each layer during closure. Consciousness was recovered in two hours and fifty two minutes.

The highest temperature was 103.6 at the eighteenth post-operative hour. The respiration rose to a height of fifty per minute and the pulse rate to 144. Oxygen was administered for several minutes (using the cupped hand, holding the delivery tube, as a nasal mask) at the extreme of the post-operative depression, with marked improvement in the patient's condition. Water by mouth was started six hours after the return of consciousness and a good balance was established. After the fourth day convalescence was uneventful.

On return from patrol, six weeks after the operation, examination by the squadron Medical Officer revealed a firm, non-tender scar.

The appendix, which had been preserved in alcohol, appeared, grossly, in its distal third, to be blackened throughout, suggesting a diffuse hemorrhage. It was submitted to the pathologist at the Australian General Hospital No. 110, for microscopical examination, the report of which is not available.

4. While it is by no means desirable to encourage major surgical procedures on naval personnel by other than qualified surgeons, yet in this particular instance, it appears that deliberation and cautious restraint preceded the operation; the operation was performed under difficult circumstances and with pioneering fortitude and resourcefulness; and that the result was entirely satisfactory.

THOS. G. WALSH.

Courtesy Wheeler B. Lipes

worked very closely with doctors who themselves spent a lot of time teaching us. And those on independent duty demonstrated that whether it was in the field with the Marines or aboard surface ships, or wherever, we could do the job.

When did you get back home?
I returned to the States in January '43 and reported to the Naval Hospital in Philadelphia, where I was promoted to warrant officer. I then represented the Navy in war bond drives and visits to war plants.

How long were you on the speaking circuit?
About 8 or 9 months. I would go from plant to plant making speeches and trying to increase production and sell bonds. This was in addition to my regular duty at the hospital.

How did George Weller come to write the original article?
When I got back from that patrol, our report—"One Merchant Ship, One Oil Tanker, and One Successful Appendectomy"—had already caused a stir. I was told I was wanted in the wardroom of the tender *Holland*. When I arrived, there was Admiral [Charles A.] Lockwood [Commander Submarines, Southwest Pacific]. He and I had a conversation and then Weller came in. He and I talked at some length and then he wrote the story.

In the last 44 years not a month has gone by that I'm not reminded of that incident. Weller's story has even appeared in high school literature books. When my grandson was in the 7th grade in New Mexico he found it in one of his books. In fact, he proudly told the teacher that that was his grandfather. The teacher said something like, "Go away little boy, don't tell stories." It's also been the subject of movies and TV programs. There was a series in the 50's called *The Silent Service,* in which the incident was portrayed in an episode called "Operation Seadragon."

I was on an airplane recently and the man next to me was reading a magazine containing one of those Ripley's Believe it or Not's. It told of a submarine sailor who removed the appendix of a shipmate. This guy turned to me and said, "Can you believe that?" I read it, shook my head, and said, "Don't believe a word of it."

Darrell Dean Rector, Lipes' patient, did not survive the war. He died 24 October 1944 in the tragic sinking of USS Tang. *On her fifth war patrol,* Tang *launched a surface attack against a Japanese transport. One torpedo ran true; the other turned sharply left, circled, and hit the submarine in the stern. The wound was fatal. There were but nine survivors. All spent the rest of the war as POW's. Ironically,* Tang*'s last torpedo ended the most successful patrol ever made by a U.S. submarine. She sank 13 vessels amounting to 107,324 tons. Her skipper, CDR R.H. Kane, survived the war and received the Medal of Honor.*

There were two other successful appendectomies performed by submarine corpsmen during the war, one aboard USS Greyback, *the other aboard USS* Silversides. —JKH

Metastatic Carcinoma Masquerading as Retropharyngeal Abscess

LCDR R.A.K. Chaffoo, MC, USN
J.P. Byrd, M.D.

D.G. was a 42-year-old white male who initially presented to the Otolaryngology Department, NRMC, Portsmouth, VA, in October 1982 with a 2-week history of odynophagia, deepening of the voice, and a sensation of "fullness in the throat" preceded by a mild URI. Examination revealed a large, exophytic green- and gray-colored mass of the right soft palate (Figure 1). Neck palpation disclosed three lymph nodes in the right jugulodigastric region each measuring 1 by 1 cm. Biopsy of this palatal mass under local anesthesia revealed moderately well differentiated squamous cell carcinoma.

The patient underwent nasopharyngoscopy, direct laryngoscopy, esophagoscopy, bronchoscopy, and precise measurement with tatooing of the palatal tumor on 15 Oct for staging and a search for a second primary. The palatal tumor measured 3.5 cm in greatest diameter and extended into the right supratonsillar fossa sparing the right tonsil. No second primary tumor was found and selected biopsies were negative. The tumor was staged as a $T_2 N_{2b} M_0$, Stage IV.

Under the recommendations of the tumor board, the patient underwent CO_2 laser excision of the palatal lesion and a discontinuous modified right radical neck dissection sparing the spinal accessory nerve on 26 Oct. Permanent section diagnosis revealed metastatic disease in 4 of 26 lumph nodes but none in the posterior triangle. The patient's postoperative course was uncomplicated, and he began radiation therapy on 3 Nov 1982.

The patient was seen in followup on 18 Nov when some edema of the right posterior pharyngeal wall was noted although he felt well. Biopsy revealed epithelial hyperplasia and dysplasia with chronic inflammation. This swelling was felt to be secondary to the effects of radiation therapy until he was seen again on 24 Nov with a marked increase in this right posterior pharyngeal wall edema (Figure 2).

Although the patient was asymptomatic, the presumptive diagnosis of a retropharyngeal abscess was entertained and needle aspiration under local anesthesia yielded 1 cc of pus and 4 cc's of serosanguinous fluid. Gram stain showed a few white blood cells but no organisms, and aerobic and anaerobic cultures yielded no growth. The patient was admitted and placed on intravenous Cephazolin but failed to show any resolution of the retropharyngeal swelling.

A computerized tomogram (CT) was obtained and revealed a large homogeneous hypodense mass in the right retropharyngeal space with a low CT number and surrounding contrast enhancement consistent with a retropharyngeal abscess (Figure 3). In light of the patient's poor clinical response to antibiotics and the findings of the CT scan, he underwent an intraoral exploration of the right retropharyngeal space revealing a large growth of tumor cells with necrosis but no evidence of a retropharyngeal abscess (Figure 4).

Anatomically, the retropharyngeal space lies in the midline, anterior to the alar compartment of the deep fascial layer and behind the posterior pharyngeal wall, proceeding inferiorly from the base of the skull to the level of the tracheal bifurcation at C_6 to T_2. This space is divided into two compartments by the superior pharyngeal constrictor which adheres to the prevertebral fascia in the midline to form a raphe.(*1*) It is in this space that the retropharyngeal lymph nodes are found as two groups, the more important laterally situated chain and the less important medially situated chain.

Retropharyngeal abscess is predominantly a disease of childhood, most often appearing in children under the age of 6–12 months. In the adult, diagnosis is often quite apparent with marked alteration in the voice, drooling of saliva, odynophagia, neck stiffness, occasional stridor, and signs of toxicity including fever and leukocytosis.(*2*)

Upon examination, swelling and fluctuance of the posterior pharyngeal

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When this article was written Dr. Chaffoo was chairman, Department of Otolaryngology/Head and Neck Surgery, Naval Hospital, New London, CT 06349.

Dr. Byrd is an otolaryngologist practicing in Cleveland, TN.

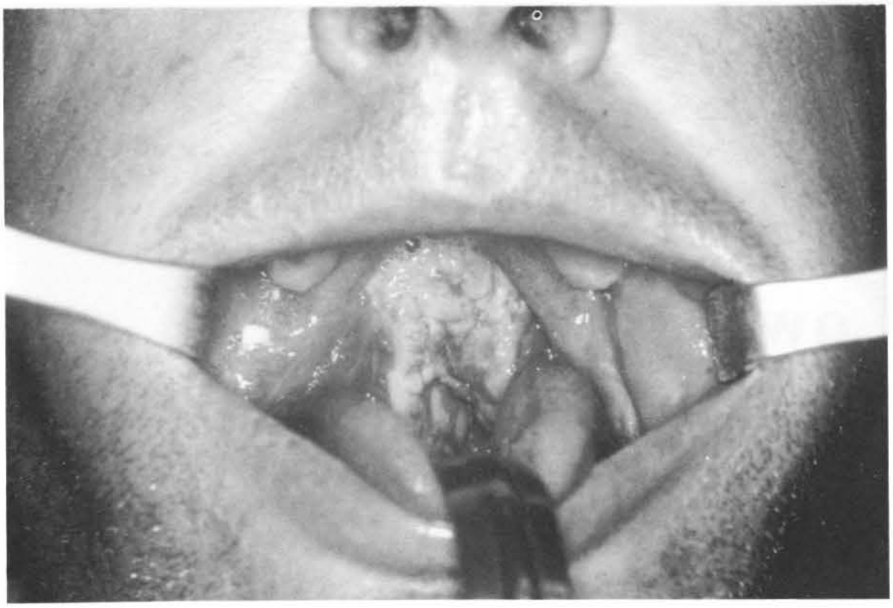

Figure 1. Preoperative view of palatal tumor.

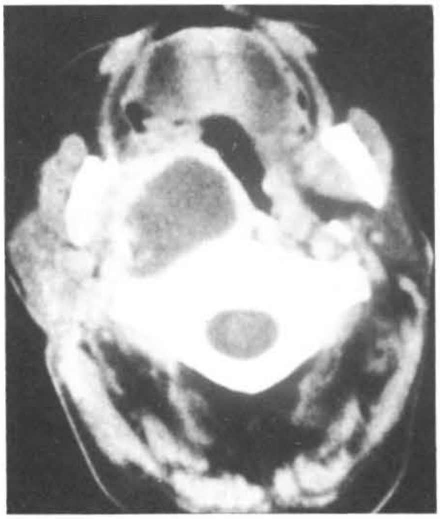

Figure 3. CT scan of retropharyngeal space (abscess is on reader's right).

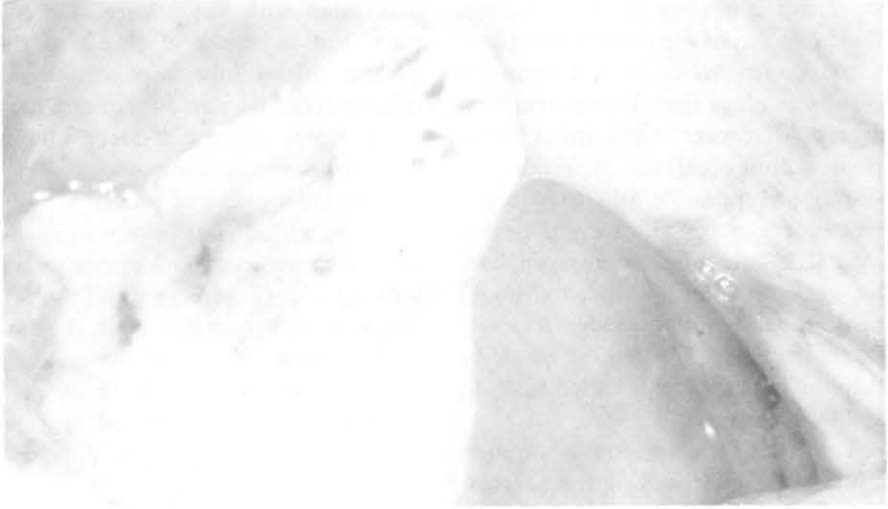

Figure 2. Posterior pharyngeal wall edema is white mass on left side of photograph (patient's right).

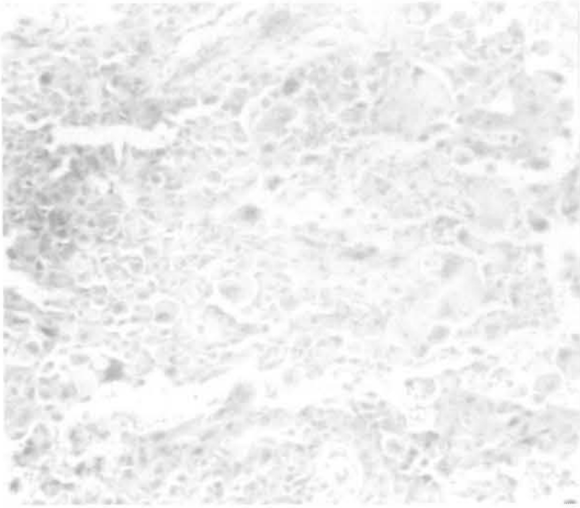

Figure 4. Biopsy photomicrograph shows poorly differentiated squamous cell carcinoma.

wall are important diagnostic signs. Lateral neck X-ray usually display soft tissue swelling throughout the prevertebral tissues of the neck, anterior displacement of the larynx and trachea, hypopharyngeal narrowing, and loss or reversal of normal cervical lordosis. (*3*)

CT scan of the retropharyngeal space may further delineate the extent of a suspected abscess, usually appearing as an area of low density with a low CT number, contrast enhancement of the wall, surrounding tissue edema, and anatomical boundaries that fit fascial spaces.(*4*) However, CT of the retropharyngeal space may not always be so specific as demonstrated by the preceding case report. Although the radiological findings were consistent with a retropharyngeal abscess, they failed to correlate with the operative findings of metastatic carcinoma.

Conclusion

The diagnosis of retropharyngeal abscess in the adult, although rare, can often be made on the basis of a thorough history and physical exam. The diagnosis may be less obvious in the child and perhaps the adult in a state of relative immunodeficiency (i.e., malignancy). Supplementary information may be obtained by specific radiographic studies. CT scan may accurately define a retropharyngeal mass but fail to distinguish between an abscess and another pathological process. In such cases, reliance upon the patient's clinical course may be more accurate.

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Orthopedics Afloat

The Lower Extremities

LCDR R.B. Wolov, MC, USN

Imagine yourself working in a floating regional medical center. Your patients: a carrier battle group's community of 10,000 plus. More then a few towns can't claim a population that size, and that "region" is never at the same place on the map for any given day. Carrier medicine is unique. Since we are *Navy* physicians, at various times in our careers we will find ourselves afloat in this environment, where we must bring ingenuity and insight as well as medical acumen in treating our patients while at sea. Treatments readily available and well established ashore are inaccessible or simply inappropriate to the demands afloat.

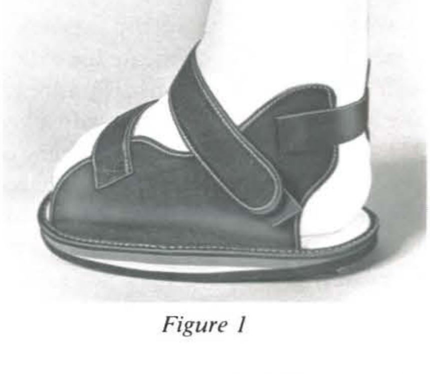
A majority of injuries in this young, vigorous population are orthopedic in nature. The treatment of these usually minor yet frequent injuries with therapeutic techniques compatible with the cramped quarters and constantly mobile world of a warship at sea has proven a challenge. It should be understood that a facility ashore is usually the preferable site for treating these injuries, particularly ones involving major joints. However, operational commitments or logistical problems may delay or preclude a medevac. The purpose of this article is to discuss a few methods of treatment found to be effective therapeutically yet allowing adequate and safe ambulation aboard ship.

Most orthopedic conditions can usually be classified as either an inflammatory process or a mechanical injury. Purely mechanical injuries, such as ligamentous sprains of the ankle and collateral ligaments or retinaculum of the knee, are quite common and all have a degree of inflammation as a normally occurring stage in the healing process. Ashore, these conditions are treated effectively with regimens which include immobilization to place the effected structures at rest. However, rigid immobilization, without certain provisions, is simply incompatible afloat. A sailor, treated for a first or second degree medial collateral ligament sprain, with his knee in a varus molded cylinder cast, cannot negotiate ladders let alone an escape hatch. Further, he would be helpless in the water if called upon to abandon ship.

The acute ankle sprain is a common injury. Usually involving the anterior tibiofibular ligament resulting from supination, these are frequently undertreated. Once fracture has been ruled out, the traditional shipboard treatment of "ice, ace, and elevation" is usually administered. Though properly applied in a correct figure-of-8 manner, the simple ace wrap can't provide rigid immobilization, turning an acute problem into a chronic one. Collagen fibers are not fully laid down at the sites of repair until 3–4 weeks and not fully mature with maximum tensile strength until 5–6 weeks. For this reason an aggressive approach is appropriate. The application of a short leg walking plaster for 3–4 weeks, or until the ankle is pain-free, is one solution. A cast's rigid support is reasonable treatment for a severe ankle sprain. Since it affords the knee freedom, it can be used aboard ship.

The difficulty of casts aboard ship arises from using the rubber cast heel, something unfortunately stocked in most sickbays. It has no place aboard ship. It creates an effective leg length discrepancy of approximately 2 or more inches. This has frequently been associated with back, knee, and hip pain, not to speak of throwing the patient off balance, especially on a rolling deck. Its narrow contact area on a steep, narrow ladder rung is obviously unsatisfactory.

Effective rigidity of a cast without these penalties can be obtained by using a canvas cast boot rather then a walking heel (Figure 1). Held by Velcro, with its broad, flat base, the cast boot is stable on a narrow rung. It allows a more natural, balanced gait. Such boots must be special ordered but are available by open purchase from Zimmer, Inc. through GSA contract. (More then likely, you will be able to obtain a few from the regional hospital before you set sail. The argu-



Courtesy of Zimmer, Inc.

Figure 1

LCDR Wolov is assigned to the Naval Hospital Branch Clinic, NAS Willow Grove, PA 19090-5010.

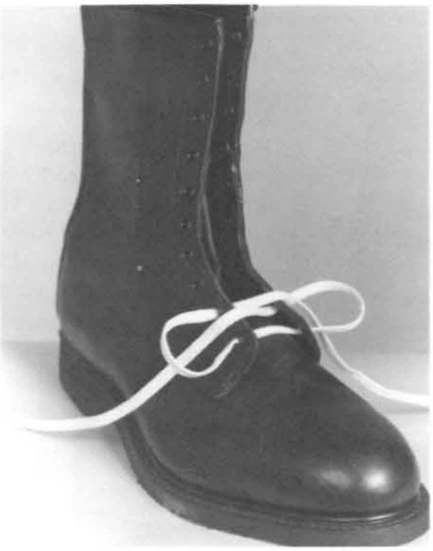


Figure 2

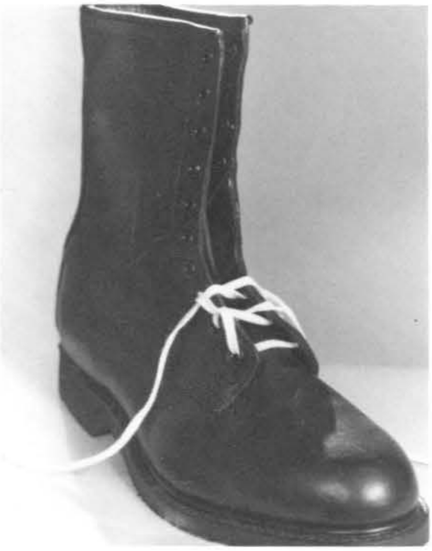


Figure 3

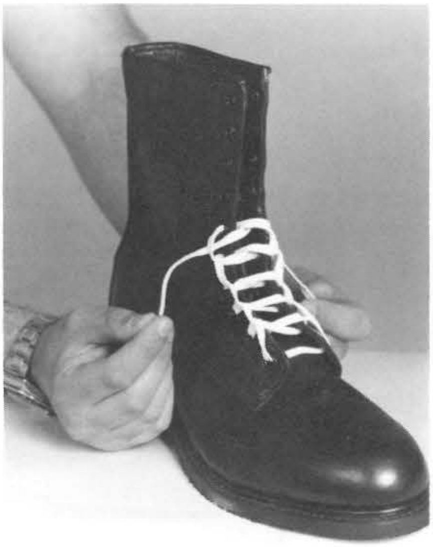


Figure 4

ment that a properly treated patient seen early will be one less for the clinic later usually works!) Cast boots are reuseable if properly cared for, a factor not to be ignored with shrinking operating budgets. Your patient will appreciate the advantage being able to remove it at bedtime and not having to track dirt into his rack.

Plaster is effective but is left as a back-up regimen for simpler therapeutic approaches. Aboard an aircraft carrier many crewmembers are of the airwing and flight deck, and are issued high top flight boots. Used with a double absorbent sock, these boots may be laced with parachute cord (such as type-3 shroud line to resist stretching) in an *interlocking pattern* (Figures 2, 3, 4). Affording semirigid immobilization while retarding supination and pronation, the interlocked laced flight boot functions much like a ski boot. It allows dorsi and plantar flexion, providing comfortable, safe ambulation aboard ship. The patient should be cautioned to treat his boot much like a cast; removing it only for sleep and personal hygiene.

The "unna" gelatin cast, advocated by some, becomes too compliant after only 48 hours to maintain rigidity and is not recommended.

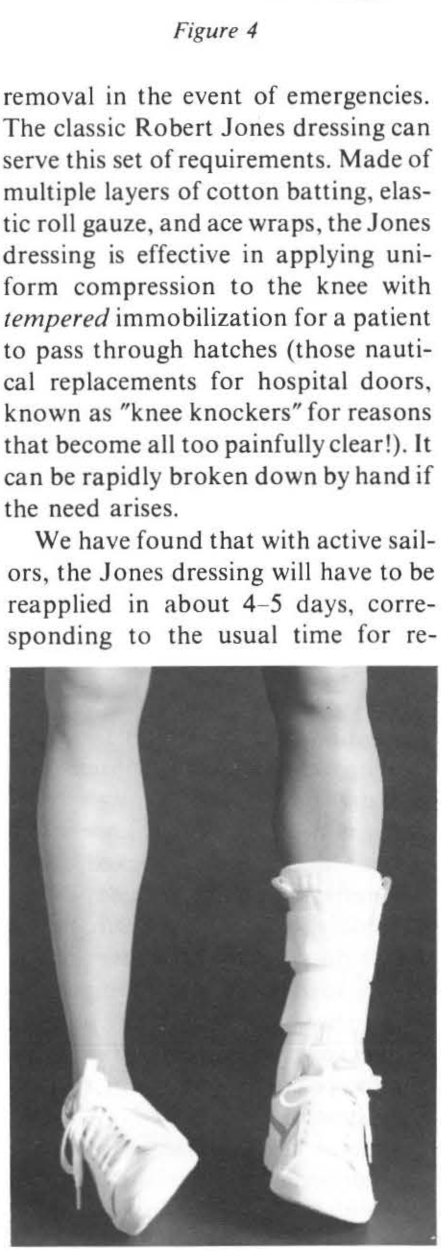
Alternatively, a 3-inch wide ankle stirrup can be made from a resin polymer fiberglass cast roll or a piece of heat moldable Orthoplast casting plastic. This stirrup is run from midcalf to midcalf, padded with moleskin and held in place with an ace wrap. This technique also serves to retard pronation and supination while allowing plantar and dorsiflexion. Additionally, it fits comfortably in a conventional shoe. More convenient to apply, though more expensive, are ready-made "Air-Stirrups"™ (Figure 5). Made totally of polyethylene, these have the advantage in that the patient can shower and even swim in them.

Lastly, tape strapping of the ankle still can serve as primary treatment for first degree sprains (Figures 6–9). The "Gibney tape boot" is easy and effective, and can always be supplanted by more rigid modalities if needed after a clinical trial. The strapping can be quickly renewed by a corpsman or the patient can be shown how to renew his own.

The diagnosis and management of knee injuries can be confusing and at times frustrating to the inexperienced. The diagnostic differentiation of interarticular injury of the knee from extraarticular is beyond the scope of this paper. Suffice it to say, that once the necessity for emergent open or arthropscopic management is ruled out, the clinician is confronted with immobilization with protected motion as his main modality.

To reiterate, function aboard ship requires a compromise between absolute rigidity and some knee mobility. Immobilization should allow for rapid removal in the event of emergencies. The classic Robert Jones dressing can serve this set of requirements. Made of multiple layers of cotton batting, elastic roll gauze, and ace wraps, the Jones dressing is effective in applying uniform compression to the knee with *tempered* immobilization for a patient to pass through hatches (those nautical replacements for hospital doors, known as "knee knockers" for reasons that become all too painfully clear!). It can be rapidly broken down by hand if the need arises.

We have found that with active sailors, the Jones dressing will have to be reapplied in about 4–5 days, corresponding to the usual time for re-



Courtesy of Aircast, Inc.

Figure 5

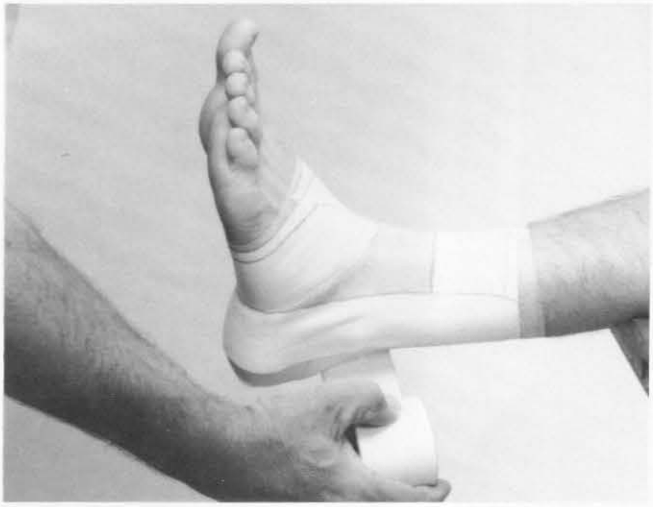


Figure 6

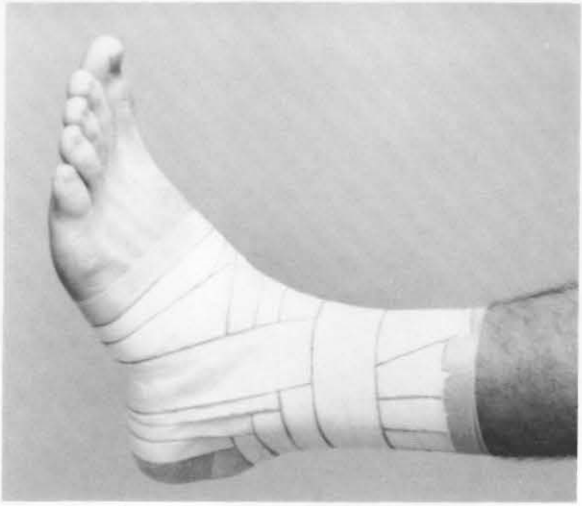


Figure 8

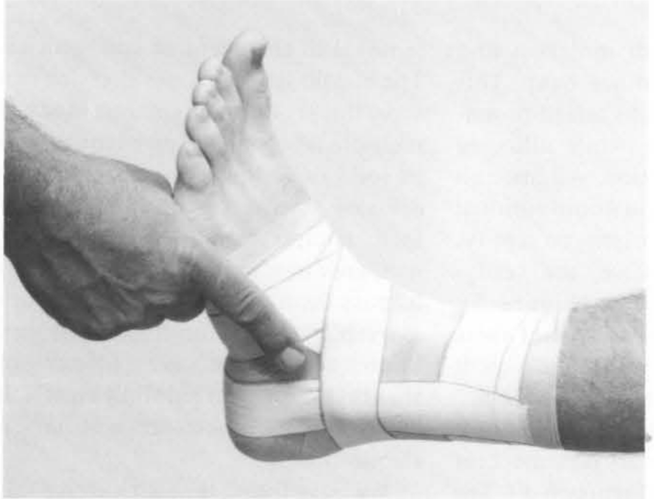


Figure 7

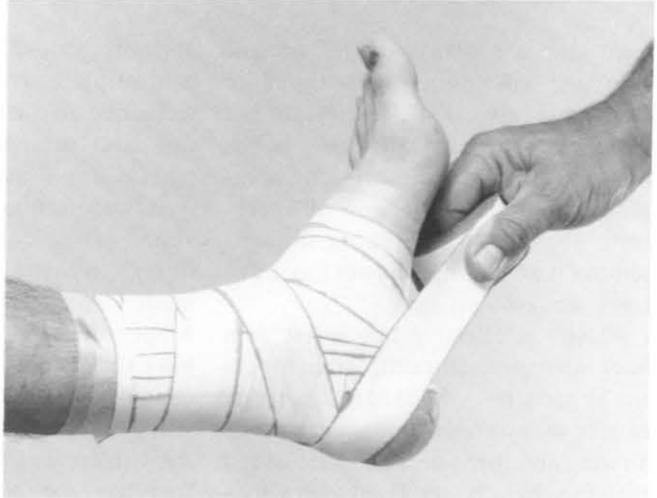


Figure 9

evaluation of a knee after the initial swelling or effusion has subsided.

More convenient though more costly is the heavy fabric knee immobilizer. Made of foam-backed canvas with removable aluminum stays, it can be rapidly applied using Velcro fasteners. It does have the disadvantage of failing to provide knee compression but can be augmented with an underlying ace wrap. However, ease of removal also opens the potential for abuse by a noncompliant patient.

Lateral subluxation or complete dislocations of the patella usually call for initial immobilization (assuming surgery is not indicated) with medially directed compression of the patella. We have found no readily available substitute for the modified cylinder cast. Commercially available braces with medializing patellar pads are manufactured, but is unlikely such devices would be found outside of a well-equipped orthopedics clinic let alone an aircraft carrier.

In summary, the practice of nonoperative orthopedics while afloat is comprised of a healthy dose of ingenuity. However, the physician must demonstrate insight into escape requirements, the work and living spaces of his patients, and the biomechanics of ambulation about those spaces. After all, that's why we're *Navy* docs!

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To the Editor

I was amazed that LCDR Zech's article on microsurgery in the March-April 1986 issue contained no mention of CAPT William E. Woodruff, MC, USNR (Ret.). CAPT Woodruff is the creator and mainstay of the microsurgery program at the Naval Hospital Oakland. He has refused to be slowed down by retirement, age, or medical problems and has devoted countless hours to the formation and maintenance of this outstanding teaching program. CAPT Woodruff deserves to be recognized for this.

Kenneth Karols
CAPT, MC, USN
NAVAIRES Alameda

The recent article "'Doc' Lipes Commandeers a Submarine Officer's Wardroom" (July-August 1986) is always interesting and amusing to consider and re-read. It must, however, be placed in proper historical perspective (like all "sea stories," fact or fiction). I cannot gainsay the apparent success of that procedure done long ago.

Nevertheless, I hasten to point out that surgery for a presumptive diagnosis of appendicitis has had no place on board a submarine in the past 30 years, at least. The use of vigorous medical treatment (antimicrobials, analgesics, fluid replacement, nasogastric suction) has been the mainstay of such management for at least three decades. And with considerable success in dozens of cases, in which interval appendectomy was done subsequently in the safer confines of a naval hospital. The success is, principally, a tribute to our astute submarine hospital corpsmen.

So, please, footnote your history. But, irrespective of the clinical limitations, it makes a good story, especially for me, a long time submarine medical officer. Moreover, I knew some of the people: LT (later RADM) Norvell G. Ward was my Commodore in 1960 (and we share the same date of birth); Charlie Miller (the diving officer) and I share the same hometown, and many common acquaintances. But footnote it anyway.

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The article about "Doc" Lipes in the July-August 1986 issue reminded me of when I first read it as a young boy in the 1940's. Awe and wonder overwhelmed me then and even now it would be beyond my courage.

Now, though, medicine has changed enough to allow us an escape from such harrowing risky surgery. These days acute appendicitis may be treated by a "closed" method using IV antibiotics, e.g., the combination of (Flagyl) metronidazole, ampicillin, and gentamycin. Possibly a new cephalosporin could be used instead of the toxic gentamycin (such as Cefoperazone).

The closed method is not a substitute for surgery but "buys time" and in some cases cures. It's ideal for those in remote places without proper surgical facilities.

J.R. Stone, M.D.
CDR, MC, USNR
Valley Industrial & Family
Medical Group
Fresno, CA

Notes

Nephrology Fellowship. There will be an opening in July for the position of a first-year fellow in nephrology. This is a dynamic 2-year clinical program with a 2-month rotation in a renowned transplant center. Strong emphasis is placed on acid-base, electrolytes, glomerulopathies, transplantation, hypertension, chronic renal failure, acute and chronic hemodialysis, peritoneal dialysis, hemoperfusion, and hemofiltration.

Interested candidates may qualify for new PCS orders. Any candidate interested in this program should call or write: CAPT T.G. Patel, MC, USN, Head, Nephrology Division, Naval Hospital, Portsmouth, VA 23708. Telephone: (804) 398-5445.

Annual London Spring Seminar. The Fifth Annual London Spring Seminar in Medical Diagnostic Imaging, 2–10 May 1987, will offer a course in computed tomography, magnetic resonance imaging, and correlative imaging modalities. The course will be presented by an internationally renowned faculty including Drs. Robert Dick, Royal Free Hospital, London; Adrien Dixon, Addenbrookes Hospital, Cambridge; Christine Heron, Royal Marsden Hospital, Sutton, Surrey; Janet E. Husband, Royal Marsden Hospital, Sutton Surrey; Michael Williams, Royal Marsden Hospital, Sutton, Surrey; Brian Worthington, University of Nottingham, Nottingham; and Ms. Jackie Pennock, Hammersmith Hospital, London, England.

Seminar participants will receive approximately 18 Category 1 GME credits. There will be a $435 registration fee.

For further information and registration write: Spring Seminar, 21915 Roscoe Blvd., Suite #222, Canoga Park, CA 91304. Telephone: (818) 340-0580, ext. 280.

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